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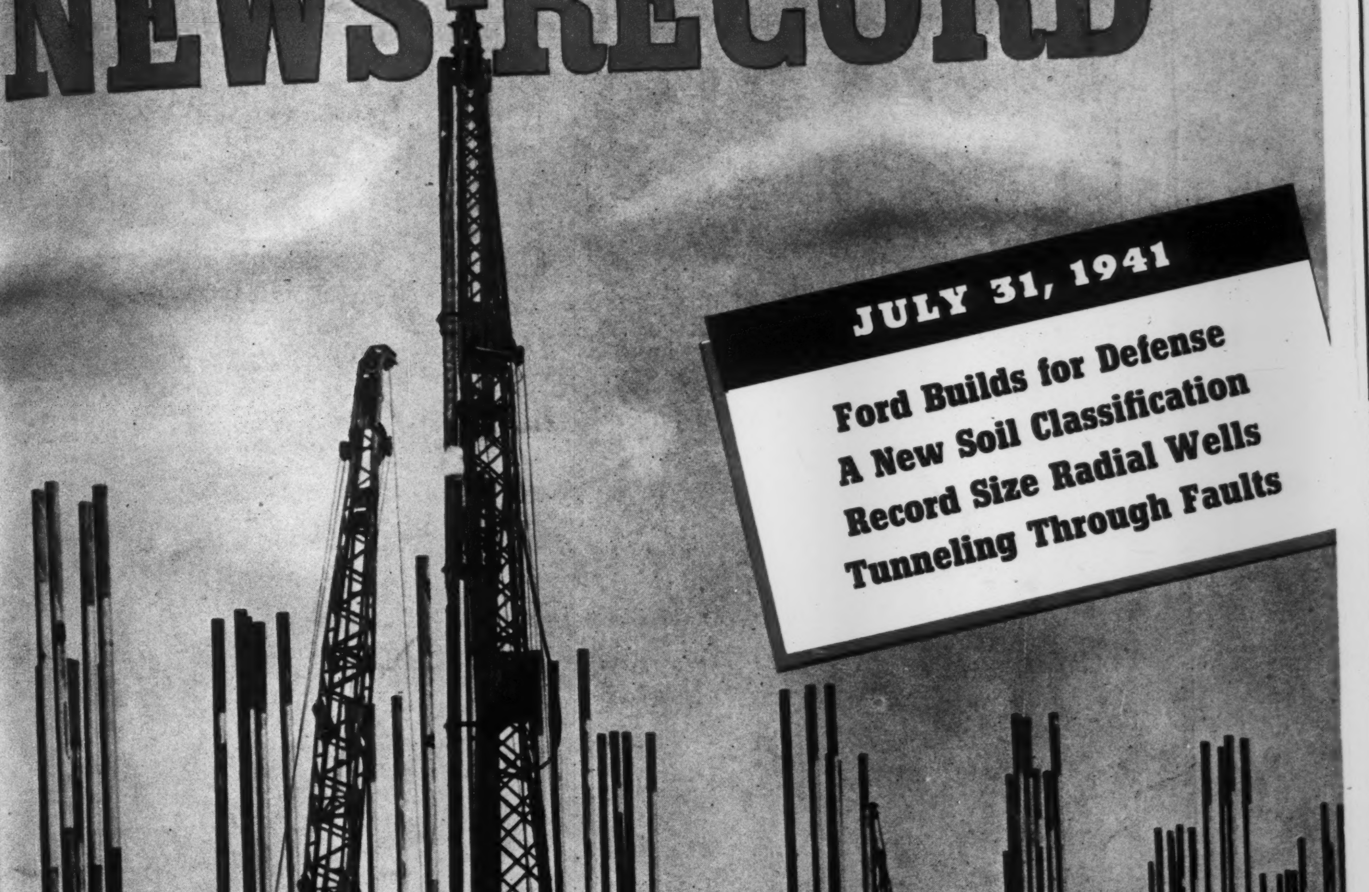
ENGINEERING NEWS-RECORD

JULY 31, 1941

Ford Builds for Defense
A New Soil Classification
Record Size Radial Wells
Tunneling Through Faults



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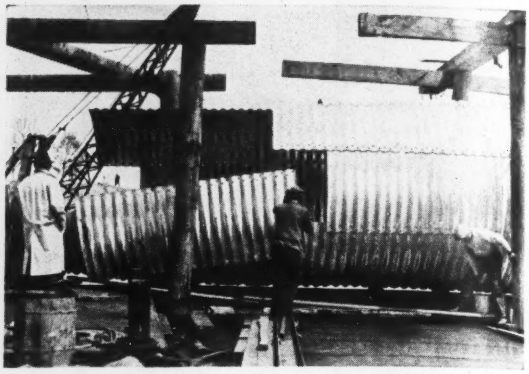

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Vol. 127 JULY 31, 1941 No. 5

THIS WEEK

• What is believed to be the largest single groundwater project ever undertaken has been completed at the War Department's Charlestown, Ind., powder plant—a radial well installation of 49,000-gpm. capacity. Construction details and description appear on page 45.

• As a follow-up on the ten articles which appeared in *ENR* on construction of the Delaware Aqueduct in 1940, we begin in this issue the first of several articles to come on new developments. This article deals with the passing of fault zones.

• In the series of articles on "Factories for Defense" appearing currently in *ENR*, one of the most interesting is the description of the new airplane engine plant for the Ford Motor Co., which appears in this issue. The plant is unique in design and construction features. Precedents have been set which will have their effect on future industrial plant design.

• Developments in welding methods and practice as applied to steel bridge construction, both in America and Europe, are reviewed through two articles, *An Old Viaduct Reinforced by Welding* and *Welded Bridge Practice in Europe*, appearing in this issue.

THINGS TO COME

• How 36 short-wave two-way radios helped solve the problem of meeting a fast construction schedule on the Kingsbury Ordnance plant for the U. S. Army will be described in an early issue.

• Methods of sealing leaky joints in masonry and solidifying loose soils by the application of chemicals are well developed in Europe, but have rarely been practiced in this country. A well-known authority on the subject will describe successful applications and techniques in the Aug. 14 issue.

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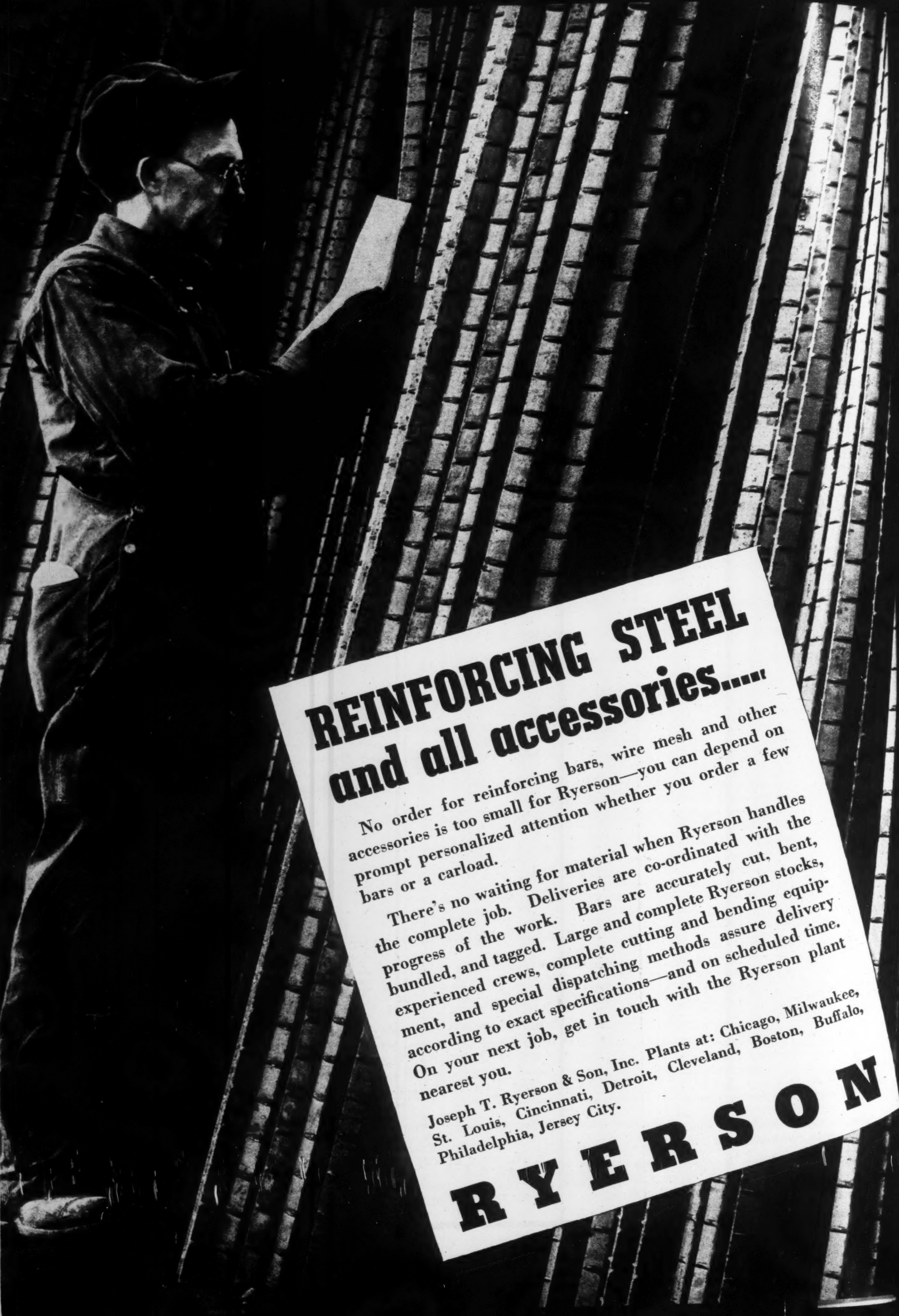

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Federal Construction Financing Nears $6-Billion Mark

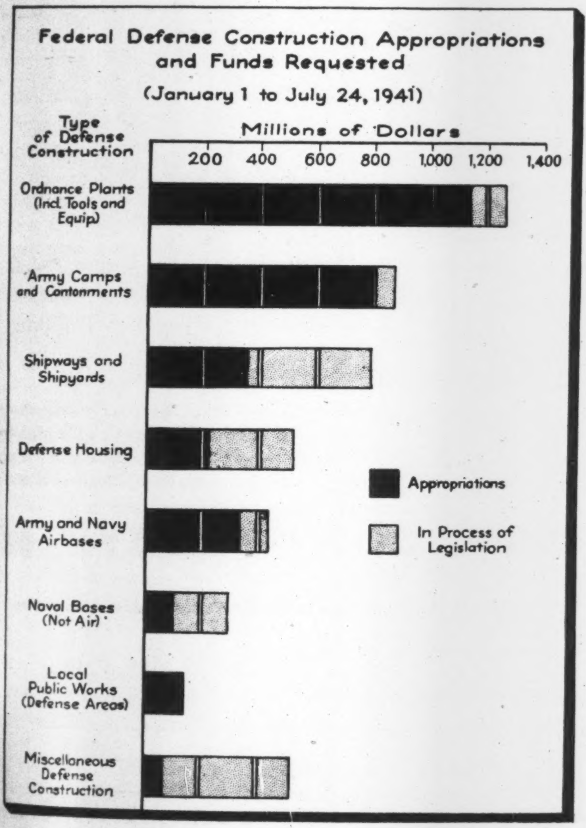
Since the first of the year requests totaling $5,867,121,000 have been made for federal funds to carry on defense and regular departmental construction. Seventy-one percent of this huge total has been appropriated.

Defense spending, naturally, plays the more important role, $4,880,639,000 having been asked for that program—$3,164,000,000 already appropriated, and $1,716,000,000 in the process of legislation.

Appropriations and requests for ordnance plant construction and equipment are responsible for 26 percent of the defense funds; army camps and cantonments, 18 percent; shipyards and shipways, 16½ percent; defense housing, 11 percent; army and navy airbases, 9 percent; and naval base construction (not air), local public works in defense areas, and miscellaneous defense construction accounting for 6, 3 and 10½ percent, in that order.

Regular departmental construction appropriations reach $986,482,000 for the year, but in some cases portions of these funds are to be used for projects closely allied to the defense program. For instance, the Commerce Department Appropriation contains $94,978,000 for airport construction; a part of the funds for TVA and Bureau of Reclamation dam construction are to aid in providing power for defense industries.

And more requests for construction funds are expected to pour in, for example, the Army's second cantonment program, and additional money for defense housing.



Federal Defense Construction Appropriations and Funds Requested

(January 1 to July 24, 1941)

Federal Funds Appropriated or in Process of Legislation for Defense Construction, January 1 through July 24, 1941

ARMY CAMPS AND CANTONMENTS

Completion of cantonment program	$575,000,000
Storage facilities	67,923,000
Additional storage facilities	112,000,000
Roads, walks, parking areas, etc	40,000,000
Army military posts	*84,000,000
	$878,923,000

NAVAL BASE CONSTRUCTION (NOT AIR)

Shore establishments	$100,503,000
Shore establishments and storage	*200,000,000
	$300,503,000

ORDNANCE PLANTS

(Includes tools and equipment as well as plants)

Doubling naval ordnance plant facilities	$194,000,000
Tin smelter, etc	12,250,000
Rolling mill	12,000,000
Lend-Lease plants (est. for plant only)	376,000,000
Munitions plants, War Dept	549,000,000
Naval ordnance facilities (additional)	*125,000,000
	$1,268,250,000

DEFENSE HOUSING

Defense housing	$150,000,000
Defense housing	75,000,000
Defense housing (requested by President)	*300,000,000
	$525,000,000

PUBLIC WORKS IN DEFENSE AREAS

Local public works (PWA)	$150,000,000
	$150,000,000

ARMY AND NAVAL AIRBASES AND AIRPORTS

Atlantic airbases, Navy	$78,445,000
Army airbases	70,000,000
Atlantic airbases, Army.	94,000,000
Atlantic airbases, Army.	51,000,000
Army air fields	45,000,000
Navy air stations	*100,000,000
	$438,445,000

SHIPYARDS AND SHIPWAYS

Expansion of private ways	$315,000,000
Lend-Lease program ways.	22,500,000
Naval shipyards, etc., and repair facilities	*460,000,000
	$797,500,000

MISCELLANEOUS DEFENSE CONSTRUCTION FUNDS

Rivers and harbors for defense	$29,676,000
Panama Canal	45,342,000
Access Roads, military highways, repairs, etc.	*287,500,000
Oil pipe line construction (Cole Bill)	*160,000,000
	$522,018,000

OTHER APPROPRIATIONS (NOT ENTIRELY DEFENSE)

WPA Deficiency Bill, $375,000,000 (Contains estimated 25 percent for defense construction)	$93,750,000
WPA Funds for 1942, $910,905,000 (Portion to aid, CAA program, military road construction, etc.)	Const. amt. not known
Interior Department (Bureau of Reclamation, etc.)	115,085,000
Commerce Department (Civil Aeronautics Admin.)	94,978,000
Other construction	2,169,000
TVA—Dams for increased power, defense mfg	70,000,000
War Department—Civil	122,000,000
Independent Offices	216,000,000
Department of Agriculture	109,000,000
Federal-Aid Highways	163,500,000

***** *Denotes bill in process of legislation.*

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The Week In Engineering and Construction

ENGINEERING NEWS-RECORD • JULY 31, 1941

AFL building trades agree to bar strikes on defense

Agreement with federal defense agencies negotiated under OPM rules out strikes, fixes wages for duration of the job and cuts overtime rates

Strikes on defense projects by unions of the Building and Construction Trades Department, American Federation of Labor, are barred by an agreement signed July 24 by AFL representatives and representatives of federal agencies engaged in defense construction—Army, Navy, Federal Works Agency, and the Maritime Commission. Negotiations looking toward this agreement have been in progress for more than a month (*ENR*, July 3, p. 1). Supplementing the agreement is a memorandum urging the OPM to use its good offices to eliminate WPA labor from defense projects in the interest of harmony in labor relations.

Concessions to the unions

The WPA memorandum is one of at least three major concessions made to the unions. The second is a wage-determination clause which in effect makes union scales in the well-organized industrial areas standard throughout the country. This is accomplished by providing that in predetermination of rates on a contract (by the federal agency, before the job is awarded), account shall be taken of actual and pending rates in the entire area from which labor is to be drawn. Since the unions have almost entirely taken over the job of furnishing construction labor, these rates will of course be union rates.

Finally, although it is nowhere definitely stated, universal acceptance of unionization on defense jobs is implicit in the whole agreement. This is nearly the case already, but the agreement will fill in the gaps.

Unions make concessions

In return for these concessions, the building trades yield on a number of points. Perhaps most important, it is agreed that rates once established on a job shall prevail until the completion of the job or until a year has elapsed.

Overtime pay is limited to time and a half. It is understood that the plumbers and plasterers, who prevented a previous agreement on this point by insisting on their traditional double time, have explicitly assented to this point.

Multiple shift operation is permitted, with only the requirement that eight hours time be paid for 7½ hours work on the extra shifts. However, time and a half must still be paid for Saturday and Sunday work.

There is considerable disagreement over the exact interpretation of the WPA clause. Some participants in the negotiations expect that it will bar WPA from the entire area under the control of the contracting agency, including even such working as grading and service road building. Others think it will merely prevent WPA work on defense buildings. Certainly the building trades will stand on the former interpretation and will probably make a stand on the issue the first time it arises.

Text of the agreement between "representatives of government agencies engaged in defense construction and the Building and Construction Trades Department of the American Federation of Labor" follows:

1. UNIFORM OVERTIME RATES: Where a single shift is worked, eight hours of continuous employment, except for lunch periods, shall constitute a day's work beginning on Monday and through Friday of

(*Continued on page 33*)

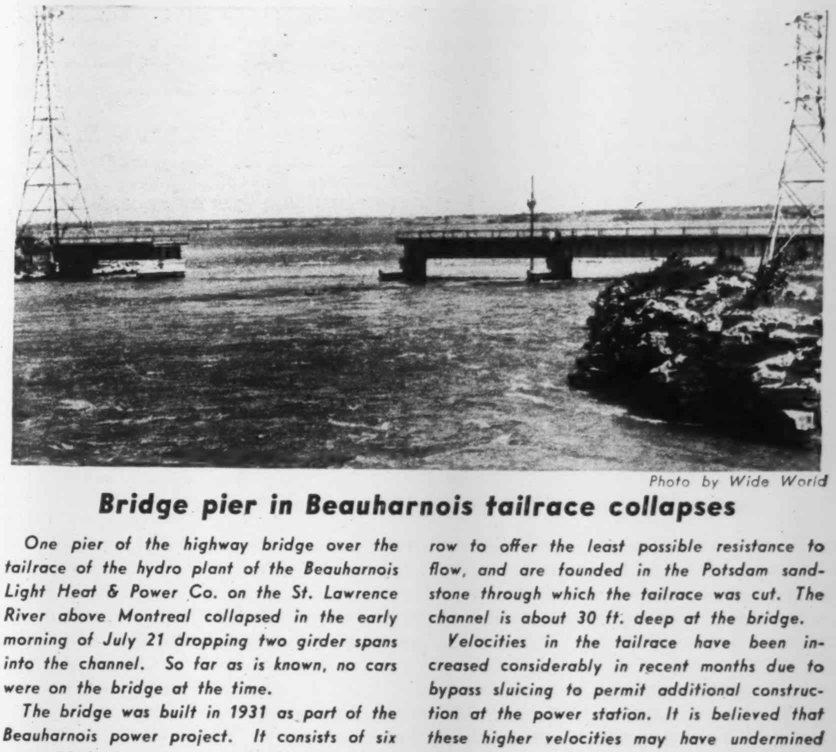


Photo by Wide World

Bridge pier in Beauharnois tailrace collapses

One pier of the highway bridge over the tailrace of the hydro plant of the Beauharnois Light Heat & Power Co. on the St. Lawrence River above Montreal collapsed in the early morning of July 21 dropping two girder spans into the channel. So far as is known, no cars were on the bridge at the time.

The bridge was built in 1931 as part of the Beauharnois power project. It consists of six spans 90 ft. long to carry the highway along the shore of Lake St. Louis across the tailrace. Its piers are of reinforced concrete, made narrow to offer the least possible resistance to flow, and are founded in the Potsdam sandstone through which the tailrace was cut. The channel is about 30 ft. deep at the bridge.

Velocities in the tailrace have been increased considerably in recent months due to bypass sluicing to permit additional construction at the power station. It is believed that these higher velocities may have undermined the pier that collapsed.

Traffic has been diverted to the roadway over the draft tubes of the powerhouse.

Road funds increased by House-Senate committee

Two major increases were inserted into the defense road bill by a House-Senate conference committee as Congressional action on the bill was completed. Amount available for improvements to the strategic network was increased to $125,000,000. This sum will be distributed among the states according to the usual federal-aid formula and must be matched with state funds on a 75–25 basis. The sum for federal construction of flight strips alongside roads was stepped up from $2,000,000 to $10,000,000. This will permit construction of half the 400 strips requested by the War Department.

In its final form the road bill authorizes appropriations totaling $295,000,000—$125,000,000 for strategic road; $150,000,000 for access road; $10,000,000 for flight strips; $10,000,000 for planning. In addition it authorizes reimbursement to states for damage out of any road appropriations up to $25,000,000, and funds drawn on for this purpose may subsequently be reimbursed by appropriation. This makes a total of $320,000,000 available for defense road work.

• • •

Project ratings set for construction priorities

Applying for the first time a priority procedure specifically intended to meet the needs of construction, the Priorities Division of OPM last week arranged to grant blanket "project ratings" to defense construction jobs. The new type of rating will be limited to projects of an unquestionable defense nature—including such work as projects of the Army, Navy, or Maritime Commission and industrial expansion on which a certificate of necessity has been granted by OPM. It is intended, for the present at least, to exclude such marginal activities as defense housing (on which a separate priority system is now being worked out) and defense roads. The new procedure will in no case be used for even the most important non-defense jobs; any priority aid to such projects will continue to be in the form of ratings attached to specific orders.

In the past a limited number of project ratings have been granted to certain particularly important jobs, but there has been no easy procedure for getting them, and they have involved considerable red tape.

As now set up the new project rating attaches an appropriate rating, depending on the defense importance of the job, to purchases of materials needed for the job. On government projects it covers all materials purchased; on other jobs it covers purchases of materials which are on the critical list (*ENR*, July 24, 1941, p. 133). Whether the rating is granted to the contractor or the owner would depend on circumstances. When a general contractor is handling the entire job and buying all materials, he would get the rating; in other cases the rating might be issued to the owner.

The recipient of the rating would complete an affidavit agreeing to its terms, return this to OPM, and then send copies of the rating to all its suppliers. To obtain priority on further orders, he need only refer the supplier to the copy already sent. The supplier in turn may extend the rating in the same manner to get materials he needs to fill the order. Users of the blanket rating must report monthly to OPM the orders on which the project rating has been used, either on a form PD-63 or by sending copies of the purchase orders. He must also keep on file for at least two years, available for inspection by OPM inspectors, records of inventories and purchase orders on all material used in the project.

No special form of application for a project rating has been established. On government projects, action would ordinarily be initiated by the government agency concerned. However, contractors who desire to obtain a project rating should write a letter, setting forth the detailed circumstances, to Ward Freeman, Priorities Division, Office of Production Management at headquarters in Washington, D. C.

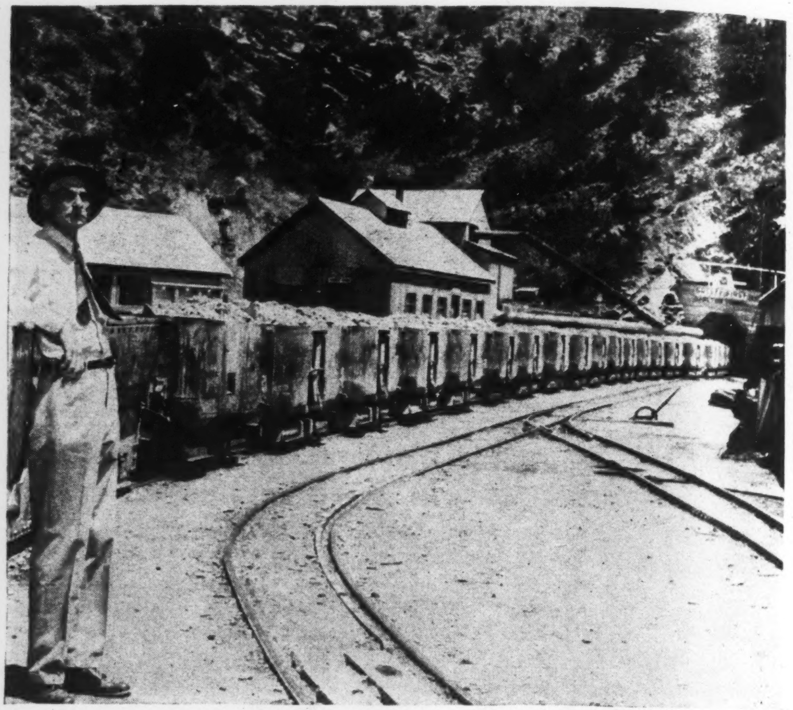


Photo by Thos. J. Barbre

Carlton Tunnel complete after two years work

July 25 or 670 working days after work started the 6-mi. Carlton Tunnel project at Cripple Creek, Colo., was officially completed. The last muck train, the 5,798th to be brought out, is shown above with John R. Austin, superintendent, at the left. The train completed removal of 180,000 cu.yd. of Pike's Peak granite that required the use of over 10,000 lb. of powder. Average daily advancement was 48½ ft.

The tunnel was driven to unwater the mines of the Cripple Creek gold mining district and some of the mines are already free from water, while others are rapidly draining. This unwatering started on Feb. 19, 1941 when the New Market fault was encountered and water ran from the portal of the tunnel at the rate of 20,000 gpm. Small crews will drift from the main bore, following faults and fissures, in an attempt to speed this water flow, although the entire Cripple Creek district would be drained at the present rate of flow without trouble.

The $1,000,000 project was started on July 13, 1939, when it was thought that four years would be necessary to complete the job. Successful completion of the tunnel in slightly over two years is attributed to good management and equipment, a novel bonus system paying every man for additional footage, and precision teamwork by the men at the heading of the lengthy bore.

An extensive review of tunnel driving procedure appeared in ENR, Nov. 7, 1940.

Civil Engineers have full and varied program for convention at San Diego

Power supply in the West, defense problems of engineers, soil mechanics, irrigation and water treatment were prominent in discussions at annual convention of American Society of Civil Engineers

California water power awaiting more industrial load, more accurate classification of soils on irrigation projects, problems in operation of irrigation canals and advances in the theory of soil mechanics were some of the more general technical subjects considered last week by the American Society of Civil Engineers holding its 71st annual convention at San Diego, July 23-25. The general session on the opening day was devoted to a symposium of report-papers on national defense; in the remainder of the meeting separate sessions were held by seven divisions.

Actions by the board

The board of direction authorized appointment of a committee to review official reports that have been made on the Tacoma Bridge collapse: the sole objective to be a technical service to the profession. Atlanta, Ga., was selected as the place to hold the fall meeting in 1943.

Publication was authorized of a manual on engineering positions and salaries based on results of elaborate studies in three states made by the society's representative.

Two resolutions presented by the board to the general session and there unanimously approved were: (1) because of the national emergency proclaimed by the President of the United States, the society pledges to the President complete support of his efforts in behalf of national defense and unqualified endorsement of any action which, as commander-in-chief of military forces, he may deem necessary in furthering national defense; and (2) addition of a new paragraph to the code of ethics of the society which, in substance, rates as unprofessional conduct any act or any practice that tends to bring discredit or dishonor on the profession.

"Total War and the Engineer" was the subject of the annual address of the president, presented at the opening session by F. H. Fowler. Following this was a series of reports and papers under auspices of the national technological committee on civilian protection. Means of emergency protection for bridges, buildings and public utilities were outlined.

A morning session of the hydraulic division was devoted to the increasingly prominent subject of hydraulic models. The nature of papers and discussions indicated that where full-scale studies cannot be made, hydraulic models have reached a stage where their useful function is accepted as an essential part of preliminary studies. Recent comparison of results on models and prototypes have done much to establish and confirm test practices. Conditions under which models do not give results similar to those obtained with the prototype are now being studied. For example, the question of how far atmospheric pressure influences these discrepancies has been considered. Thus far, however, pressure reduction tests on models have been limited to cavitation.

Power abundant in California

In a paper on "Electric Power Supply of California and the Southwest," Lester S. Ready, consulting engineer, San Francisco, presented figures leading to the conclusion that "present plant capacities appear to be adequate to meet all reasonably anticipated load additions." Interconnected transmission systems and full reservoirs are important factors. Lake Mead, he pointed out, is full and should be lowered some 8 million acre-feet in the next eight months to provide for more flood storage. Meantime some 4 or 5 million acre-feet can be expected to flow in, making a total of about 12 million acre-feet that should be used for power development in the next eight months. At 425 kw.-hr. per acre-ft. (under full reservoir head) this means 5 billion kilowatt-hours available in the next eight months of which some 2 billion is secondary power.

Boulder Dam, he said, has enough spare energy to meet the growth of the southern California area for the next year or two. Besides Lake Mead, Roosevelt and other Arizona dams are storing full reservoirs.

A. R. Arledge, principal civil engineer, Los Angeles Bureau of Power and Light, pointed out that interconnection of transmission systems is such that California power companies are operated on what is practically a "pool basis" thus effectively reducing the reserve necessary for security. Industries such as the manufacture of airplanes, he said, are really assembly or parts operations, and employees in such plants used an average of about one kilowatt (installed capacity) each including both factory and domestic requirements per employee. Basic industries, such as ingot production, on the other hand (aluminum and magnesium, for example) would make enormously larger demands on the power companies. To meet such possibilities arrangements are now being made, he said, to provide ample power reserves.

"Determining Factors in the Design of Shasta Dam" was the subject of a paper by K. B. Keener, designing engineer on dams, U. S. Bureau of Reclamation, Denver. The 560-ft. height of this dam (present estimate) was not the reason for selecting the type of structure adopted, he said; geology and topography are likely to be principal factors in selection of site and type. The necessity for a central spillway at this site with a possible

Prominent engineers attending Am. Soc. C. E. meeting

From left to right: C. Wayland Capwell, chairman, San Diego Section; Fred D. Pyle, hydraulic engineer, city of San Diego; Frederick H. Fowler, president Am. Soc. C. E.; John P. Hogan, past president of Am. Soc. C. E., consulting engineer, New York; E. P. Goodrich, New York; and Walter D. Binger, Commissioner of Borough Works, New York, chairman of the National Technological Committee on Civilian Protection.

flood of 187,000 sec.-ft. (in addition to other means of passing stream-flow) going down a 480-ft. drop (the world's highest overpour spillway) was an important factor in type selection. To dissipate energy in the spillway 18 ducts through the dam will discharge into the overpouring stream.

Discussion of Mr. Keener's paper brought out the fact that the Shasta power plant and the Keswick plant located just below as an after-bay development, will have a total dependable output of about 700,000,000 kw.hr. per year. Total power requirements for irrigation pumping on the Central Valley project will be about 480,000,000 kw-hr per annum. First power from this plant is now expected to be available in the fall of 1943.

In reporting for the joint committee on masonry dams, A. V. Karpov, consulting engineer, Pittsburgh, suggested that maintenance of dams be considered under three heads: (1) foundation conditions; (2) permanency of concrete and (3) adequacy of design. More or less rapid deterioration of concrete in dams always takes place, he said, and serious damage has often developed; in some cases to such an extent that it is cheaper to rebuild than to repair.

Discussing this paper, William P. Creager, consulting engineer, Buffalo, N. Y., referred to many concrete dams that had all the appearance of "having had leprosy" with a sloughing off or spalling of the surface at the rate of 1 to 5 in. in ten years. There is, he said, no generally accepted repair practice but it would be desirable to give consideration to (1) cause of deterioration, (2) best methods of repair and (3) means of preventing recurrence. Most of this type of damage, he said, has been observed in dams built prior to 1930 and in high altitudes or where the concrete had been exposed to extensive frost and temperature changes.

Sanitary and irrigation divisions

R. F. Goudey, sanitary engineer, Bureau of Waterworks and Supply, Los Angeles, traced the development of zeolites from their first development in 1907 to the development of carbonaceous zeolite in 1935. Although the cost of these materials is still very high, he said they have many uses in industry and it may be that their use will become economical even for irrigation waters with too high a sodium chloride content.

Well water supplies of the Los Angeles coastal plane were discussed in a paper by Louis J. Alexander, designing engineer, Southern California Water Co., Los Angeles. This area (basins of the Los Angeles, San Gabriel and Santa Ana rivers) has a supply of 600 mgd. exclusive of that imported through the Owens

(*Continued on page* 36)

Foundation failure causes slump in big dike at Hartford, Conn.

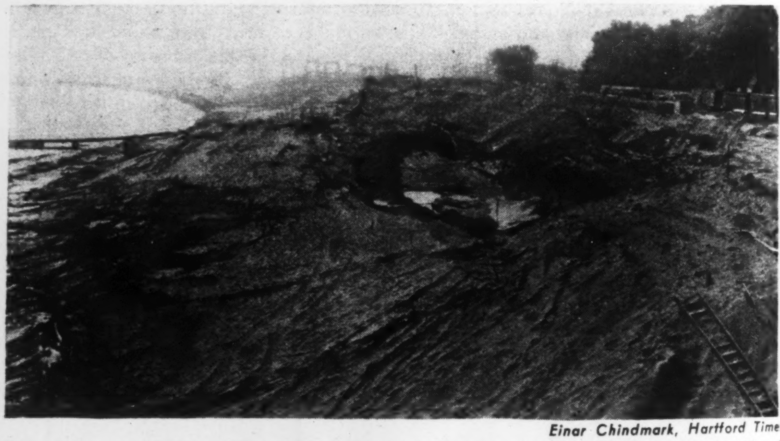
A 1,000-ft. section of a new flood-control dike and highway embankment along the Connecticut River at Hartford, Conn., slumped and moved about 50 ft. out into the river on the morning of July 24 just as hydraulic filling for the highway embankment was drawing to a close.

A section through the embankment is given in the accompanying drawing. The flood-control dike, a rolled-earth fill, had been completed to practically full height two weeks prior to the slide by the A. I. Savin Construction Co., under contract with the Providence District, U. S. Engineer Office. During the days previous to the slide the Connecticut State Highway Department had the contractor sluicing sand from the river into a fill between the new dike and the old dike of the Colt arms plant to make one of the approach roads for the new bridge now being built over the river just south of the point where the slide occurred.

The embankment rested on 45 ft. of soft varved clay which, according to Lt. Col. Harley Latson, district engineer at Providence, had been analyzed as sufficient to support the load of the flood-control dike with the probability that several months normally would be required to consolidate the foundation to withstand a greater loading. The Providence District had warned the State Highway Department a few days before the slump of the danger of overloading the foundation by building the highway fill without regard to limiting its height and extending the placement time.

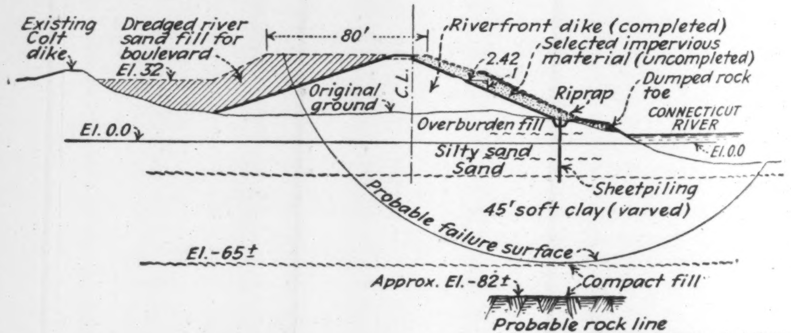
Col. Latson states that the slide evidently was deepseated, near the bottom of the varved clay stratum, and moved both the highway and dike fill out about 50 ft., the slump being about 25 ft. A preliminary investigation, he states, indicates a typical shear failure by a circular slide through the clay foundation due to overstress in the clay caused by addition of the highway fill.

The nature of the material involved in the failure is such that the type of work may have to be changed to a combined highway viaduct and flood wall on piles. Bearing piles would have to go down about elevation minus 60.



Einar Chindmark, Hartford Times

Slumped bank looking downstream toward the new bridge. About 1,000 ft. of bank slumped 25 ft. and moved 50 ft. out into the river. The railway cars are on top of the Colt dike.



U. S. Engineer Office, Providence

Section through the flood-control dike and highway embankment at Hartford showing probable line of failure.

F. E. Weymouth's death ends long, active career

The death of Frank E. Weymouth on July 22 at the age of 67 marks the passing of another veteran of early days in the U. S. Reclamation Service (Bureau of Reclamation), a recognized authority on irrigation practice, and an engineer closely associated with the development of the Colorado River, from the first planning of Boulder Dam to the delivery of domestic water at Los Angeles. For the past 10 years Mr. Weymouth served as general manager and chief engineer of the Metropolitan Water District of Southern California, a period covering the work of planning, designing and constructing the Colorado River aqueduct project, and at his own request he was to have retired on July 31 to the position of consulting engineer for the district.

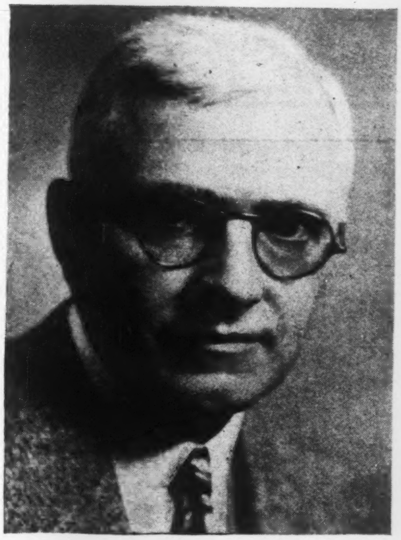
Mr. Weymouth was born in Medford, Maine, June 2, 1874, and in 1896 graduated from the University of Maine in civil engineering; this institution honored him with the degree of doctor of engineering in 1934.

Among his early engineering work was a two year period with the Isthmian Canal Commission on surveys and studies in connection with the proposed Nicaraguan canal.

In 1902 with the creation of the U. S. Reclamation Service he joined this engineering organization and served in capacities of increasing responsibility, becoming chief engineer in 1920. His first work with the Reclamation Service (predecessor organizaton to the present Bureau of Reclamation) included investigations for engineering projects in Montana, and in 1908 he was appointed supervising engineer for work in Idaho. In this capacity he directed the development work on the Snake River, and directed construction of the Arrowrock Dam on the Boise River.

From 1916 to 1920, when Mr. Weymouth served as chief of construction in charge of all work carried out by the Reclamation Service, and during his four years as chief engineer (1920-1924), the organization went through an important period in developing new methods of dam design and construction.

Resigning in 1924 he spent a period of two years in private consulting practice under the firm name of Brock & Weymouth at Philadelphia. He then accepted the position of chief engineer for the J. G. White Engineering Corp. and was in active charge of all engineering work for this organization on extensive irrigation projects in Mexico.



F. E. Weymouth

In 1929 Mr. Weymouth was retained by the city of Los Angeles and began studies of the proposed Colorado River aqueduct as a preliminary to appointment as chief engineer of the Metropolitan Water District which was being formed at that time. In 1931 he was appointed to the position of general manager and chief engineer, a position he held during the entire design and construction period. This $220,000,000 aqueduct project, of unparalleled magnitude in the field of water supply engineering, has been fully reviewed in the pages of *Engineering News-Record.*

Mr. Weymouth was a member of the American Society of Civil Engineers, and was elected to honorary membership in 1938.

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AFL agrees to bar strike

(*Continued from page* 29)

each week. Where work is required in excess of eight hours on any one day or during the interval from 5:00 p.m. Friday to 7:00 a.m. Monday, or on holidays, such work shall be paid for at 1½ times the basic rate of wages.

2. UNIFORM SHIFTS: Where two or more shifts are worked, five days of 7½-hr. shifts from Sunday midnight to Friday midnight, shall constitute a regular week's work. The pay for a full shift period shall be a sum equivalent to eight times the basic hourly rate and for a period less than the full shift shall be the corresponding proportional amount which the time worked bears to the time allocated to the full shift period. Any time worked from Friday midnight to Sunday midnight or in exces of regular shift hours shall be paid for at 1½ times the basic rate of wages. Wherever found to be practicable, shifts should be rotated.

3. NO STOPPAGE OF WORK: The Building and Construction Trades Department of the American Federation of Labor agrees that there shall be no stoppage of work on account of jurisdictional disputes, or for any other cause. All grievances and disputes shall be settled by conciliation and arbitration.

4. SUBCONTRACTORS: It shall be the policy of all federal contracting agencies to require the utilization of specialty subcontractors on those parts of the work which, under normal contracting practices, are performed by specialty subcontractors subject, however, to the following:

(a) When a general contractor can demonstrate that specialty work has been customarily performed by his own organization and that his existing organization is competent to perform the work, he may be permitted to do so.

(b) Where the performance of specialty work by specialty subcontractors will result in materially increased costs or inordinate delays, the requirement hereinbefore mentioned may be waived.

On negotiated contracts, the decision as to which parts of the work will be performed by subcontract will, insofar as may be practicable, be made at the time the contract is negotiated.

5. PREDETERMINATION OF WAGES: In predetermining the minimum wage which is to be paid to contractor's employees on the specific construction job, consideration shall be given to the rates prevailing in the area from which labor must be drawn to man the job and to new wage rates which have been negotiated and concluded through bona fide collective bargaining processes which will take effect at a future date.

Wage rates paid at the start of work on a project shall continue until the completion of the project, or not more than one year, and new agreements or new determinations of wages for work in the same area will become effective only on new jobs started or new contracts signed after the employer-employee agreement has been negotiated.

6. APPLICATION OF AGREEMENT: Any contract work done for or through any federal agency for defense purposes within the continental limits of the United States and the Panama Canal Zone shall be governed by this labor policy.

It is understood that the provisions of this agreement shall apply only to national defense projects.

7. APPRENTICES: It is agreed that the number of apprentices used shall be limited to the number agreed upon between the respective unions and contractors and approved by the Department of Labor in the case of those unions and employers associations that have established apprenticeship standards in conjunction with the Department of Labor and the number of apprentices in other cases shall conform to the usual practice prevailing between the unions and the employers associations of the respective trades.

8. BOARD OF REVIEW: There shall be constituted a board consisting of a representative of the government agencies, a representative of the Building and Construction Trades Department of the A. F. of L. and a representative of the OPM. It shall be the function of this board to interpret the provisions of this agreement, to adjust disputes arising hereunder, and the findings of the board shall be binding on the parties to the agreement. In case of a dispute involving a specific governmental agency, that agency may designate a representative as a temporary member of the board for the mediation of that dispute. The board shall have no authority to encroach upon or to relieve any governmental agency of its legal authorities and/or responsibilities.

SUPPLEMENTARY MEMORANDUM

Submitted to the Office of Production Management by representatives of government agencies engaged in defense construction and the Building and Construction Trades Department of the American Federation of Labor on the subject of Work Projects Administration labor in constructing defense projects.

It was the general consensus of opinion of the conferees on construction labor that Work Projects Administration labor on construction projects was detrimental to peace and harmony in labor relations on the projects and the conferees submit the matter to the Office of Production Management with the request that the subject be studied in the light of the existing law and administrative orders. To the end of harmonizing and expediting the defense construction program it is urgently requested that legislative and administrative action be immediately sought which will eliminate Work Projects Administration labor on projects upon which are employed members of organizations represented by labor signatories hereto.

Pennsylvania contractors cash in on safety record

For the third time in four years compensation insurance premium rates in Pennsylvania for principal construction classifications have been reduced. The new manual rates, effective July 1, 1941, show reductions from 6 to 25 percent from the previous rates on 11 construction classifications.

Contractors credit the successive lowering of compensation insurance costs, in part at least, to the effective accident prevention program conducted by the Constructors Association of Western Pennsylvania under the direction of Roy A. MacGregor, executive secretary (*ENR* Aug. 29, 1940, p. 283).

Following is a schedule of the new rates on certain classifications, compared with those previously in effect:

Code	Classification	1940	1941	Percent reduction
601	Road and street const.	$6.45	$5.40	16
603	Sewer const.	8.00	6.00	25
605	Railroad const.	6.00	5.60	7
607	Drilling by contractors	4.35	3.55	18
609	Excavation	5.60	3.95	14
611	Piledriving	10.00	7.50	25
615	Tunneling, shaft sinking	*	9.00	..
653	Masonry	3.90	3.35	14
654	Concrete const.	7.45	7.00	6
655	Iron erection	12.50	11.00	12
713	Dredging	4.00	3.15	21

* On application on account of occupational disease benefits.

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Indiana road commission develops post-war plans

Development of a state-wide highway modernization program in readiness for the transition period following the present national emergency has been started by the State Highway Commission of Indiana as a means of providing employment for the thousands of men now in military service or in defense industries. James B. Adams, chairman of the commission, estimates that at least $150,000,000 can be wisely spent in the modernization of Indiana's state highway system when this transition period arrives. The program will include extension of dual-lane mileage, relocation of roads around congested areas, widening and reconstruction of bridges and grade separations, widening and improving road surface, improvement of state highway routes in cities, and other similar projects.

Preliminary lists of future projects are being submitted by the six district engineers. As rapidly as the commission can develop a coordinated program from these recommendations, surveys will be started and the field notes translated into plans and specifications for each project. By having surveys made and plans prepared the commission will be ready to act when the new federal public works reserve program is inaugurated.

JOBS OF THE WEEK

CAMP—Augusta, Ga.

J. A. Jones Construction Co., Charlotte, N. C., Smith-Pew Construction Co., and MacDougald Construction Co., Atlanta, Ga., have been awarded contract for constructing camp at $22,800,000, by Construction Quartermaster, Atlanta, Ga.

WOLF CREEK DAM—Jamestown, Ky.

S. A. Healy Construction Co., White Plains, N. Y., has been awarded contract for constructing Wolf Creek Dam and appurtenant works, at $15,803,890, by U. S. Engineer, Nashville, Tenn.

BOMBER PLANT—Ypsilanti, Mich.

Bryant & Detwiler Co., Detroit, Mich., has been awarded contract for 1 and 3 story 500x1,208 ft. and 700x3,200 ft. brick, steel, superstructure for bomber plant, at $31,961,300. Additional for equipment $15,658,871. Contract let by Ford Motor Co., Dearborn, Mich., Defense Plant Corp., will finance. Albert Kahn, Inc., Detroit, Mich., archt. and engineer.

AIR DEPOT—Rome, N. Y.

Turner Constructiont Co., New York, N. Y., and Louis Mayersohn, Albany, N. Y., have been awarded contract for constructing Air Corps Depot, at $10,000,000, by U. S. Engineers, Binghamton, N. Y. Air Depot Engineers consist of Alfred Easton Poor, Gibbs & Hill, Inc., and Fred N. Severud, New York, N. Y., engineers and architects.

ALUMINUM PLANT—Spokane, Wash.

Aluminum Co. of America, Pittsburgh, Pa., will design and construct aluminum plant by own forces at $9,000,000. Union Carbide & Carbon Co., Portland, Ore., will operate. Defense Plant Corp. will finance.

STORAGE FACILITIES—Oakland, Calif.

Clinton Construction Co., Dinwiddie Construction Co. Inc., Monson Bros., Duncanson-Harrelson, all of San Francisco, have been awarded contract for constructing additional storage facilities at Naval Supply Depot, and Marine Corps Depot of Supplies, at $7,337,000, by Navy Dept., Wash., D. C.

HOUSING—Shaler Twp., Pa.

Madsen Construction Co., Minneapolis, Minn., has been awarded contract for constructing Shalercrest defense housing project, 250 families, at $1,008,091, for FWA, by Allegheny County Housing Authority, Pittsburgh. Clarence S. Stein, New York, N. Y., architect.

AIRPORT—Bethel, Alaska

Morrison-Knudsen Co., Boise, Idaho, was lowest bidder grading, paving and buildings for airport at $1,566,358, by Civil Aeronautics Authority, Wash., D. C.

ALUMINUM PLANT—Tacoma, Wash.

Aluminum Co. of America, Pittsburgh, Pa., will design and construct aluminum plant by own forces at $5,000,000. Olin Corp., Pittsburgh, Pa., will operate. Defense Plant Corp., will finance.

FLYING SCHOOL—Albany, Ga.

Hardaway Contracting Co., Columbus, Ga., has been awarded contract for constructing auxiliary landing field, 50 additional buildings, at $1,194,820, by U. S. Engineer, Wash., D. C.

ENGINE TEST BUILDING—South Bend, Ind.

Consolidated Construction Co., Chicago, Ill., has been awarded contract for constructing engine test building at $1,790,000, by Studebaker Corp., South Bend. Defense Plant Corporation, will finance. Giffels & Vallet, Detroit, Mich., engineers.

TERMINAL MARKET—Brooklyn, N. Y.

Federal Construction Corp., New York, N. Y., was lowest bidder for constructing Terminal Market, Avenue D, Foster and Remsen Aves. E 83 St. and property of Long Island R.R. at $1,067,000, by Department Public Works, New York.

HOUSING—Norfolk, Va.

William Muirhead Construction Co. Inc., Durham, N. C., has been awarded contract for constructing 300 units defense housing project at $1,084,000, for USHA. by Norfolk Housing Authority.

BAG LOADING PLANT—Flora, Miss.

Charles Weaver Construction Co., and Associates, Jackson, S & W Co., Memphis, Tenn. and Eastern Construction Co., Winston-Salem, N. C., have been awarded contract for the construction of bag loading plant by the War Department, Washington, D. C. Estimated cost $15,000,000. General Tire & Rubber Co. will operate approved by Office Production Management.

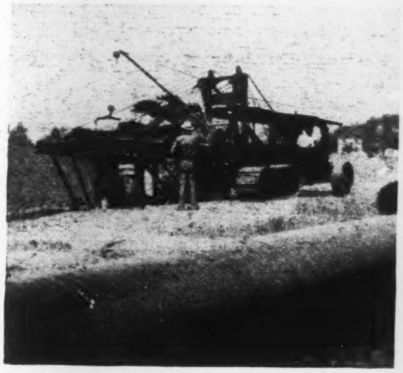
NOTE—Additional bidding and contract news on over 800 projects large and small appear in the Construction News section beginning on page 97

Portland-Montreal pipeline will be joined at border celebration

Formal ceremonies on Aug. 1 will signalize fast progress on 236 miles Esso crude oil pipeline to Canada. Construction expedited by 1,700 men and $300,000 of new equipment

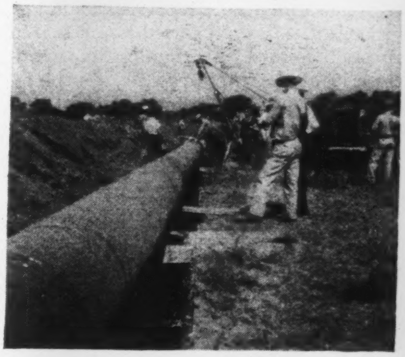
An international celebration will take place on Aug. 1 when the Portland-Montreal oil pipeline will be joined near Highwater, Que., on the border between the United States and Canada. On that day, in the presence of officials from both countries, welders will make the joint connecting sections of the first crude oil pipeline in the northeastern area.

The line is a 12¾-in. steel pipe which will carry 50,000 barrels of crude oil per day from Portland harbor to Montreal refineries, and thus save 10 to 12 days of travel by tankers. The 236-mile line is a national defense project engineered and financed by the Standard Oil Co. of New Jersey.



Wheel-type ditching machines make rapid excavation for Portland-Montreal pipe-line where digging conditions are good. Back hoes are used extensively in boulder-strewn areas.

Welding adjoining sections of 40-ft. lengths of 24-in. pipe which is used at the Portland terminus of the Portland-Montreal line. A scene such as this will be enacted at the border on Aug. 1.



Sections of pipe 40 ft. long are joined by welding and lowered into a 3-ft. deep trench on the Portland-Montreal pipeline. A mile a day is considered good going.

Construction work was started on June 28 and by Aug. 1 a total of 45 miles will be completed. Final completion of pipe installation is set for Oct. 31, and oil is expected to flow on Dec. 1, when the eight pumping stations along the line have been placed in operation. The cost of the project is over $8,000,000.

Last week an *Engineering News-Record* editor trudged over the pipeline work now under way and found some 1,700 men working on a 10-hr. shift, seven days a week to complete the job in time. This labor force supported by some $300,000 worth of new construction equipment is expediting the work. At Gorham, N. H., one-third the distance from Portland to Montreal, the Oklahoma Contracting Co. of Dallas, holder of one contract, is pushing operations southeast to Portland with 500 men.

From Gorham to Montreal, Williams Bros. Corp. of Tulsa, Okla., is laying pipe with crews working on various sections of the line. In addition, the Williams Corp. is building eight pumping stations each of which is equipped with two 1,500-gph. horizontal triplex reciprocating pumps.

In Portland harbor a "finger" wharf is under construction to accommodate 150,000-bbl. tankers bringing crude oil from Colombia and Venezuela. Oil will be received in six 140,000-gal. capacity storage tanks prior to entering the pipeline. From these tanks it will be moved at the rate of three miles per hour toward Montreal. Complete details of the construction features on this work will be described in an early issue.

Progress in pipelines

Pipeline construction in the United States this year will be at a new peak in the oil industry's history, if projected plans for all companies are carried out. It is estimated that at least 10,000 miles of new pipeline construction will be undertaken this year, compared with about 6,500 miles in 1940 and 5,000 miles in 1939. At the end of 1940 the total pipeline mileage, represented by crude and product, refinery and gathering lines, approximated 126,400 miles. In 1917 there were only 50,000 miles of line in operation.

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Leonard made engineer on TVA's Hiwassee projects

George K. Leonard, formerly construction engineer at Cherokee Dam, has been named project manager for all four of the Tennessee Valley Authority's new Hiwassee projects (Chatuge, Nottely, Apalachia, and Ocoee No. 3 Dams), according to announcement by Col. Theodore B. Parker, chief engineer of the Authority.

Mr. Leonard, who joined the TVA's engineering staff in 1933, has worked at the Authority's Wheeler, Guntersville and Watts Bar Dams, and previously he had experience in construction work in Nebraska, Illinois and Missouri. Mr. Leonard's place at Cherokee has been filled by Thomas F. Taylor.

Other appointments on the Hiwassee project are on Apalachia Dam, C. P. Wright, construction engineer, and T. L. Brown, construction superintendent; Nottely Dam, J. W. Clarke, assistant construction engineer, and R. C. Perkins, construction superintendent; Ocoee No. 3 Dam, E. A. Prokop, construction engineer; Chatuge Dam, E. H. Morgan, assistant construction engineer, R. V. Sass, construction superintendent. All appointments represent promotions of men long with the Authority.

Chester W. Larner, president of the Larner Engineering Co. in Philadelphia, and Paul Frederick Kruse, chief engineer of the Bangor, Me., Hydro-Electric Co., have been retained as consultants in connection with the design of Apalachia and Ocoee No. 3 projects. Both projects will have long tunnels leading from the dams to downstream powerhouses in order to gain additional head.

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New California branch office for U. S. Engineers

Due to rapidly expanding defense construction, the establishment of a new branch of the Los Angeles U. S. District Engineer Office has become necessary. The new branch office, to be located at San Bernardino, will be in charge of Deming W. Morrison, senior engineer, formerly head of the flood control design section of the Los Angeles office.

Civil engineers meet at San Diego, Calif.

(*Continued from page* 31)

Valley and Colorado River aqueducts. In this coastal plane there are 59 basins in all with 73 types of water.

Phenomenal increase in the population of San Diego from 100,000 to 300,000 in a short time has created difficult and unusual problems, according to B. D. Phelps, assistant city engineer, San Diego, resulting from concentration of bacteria in the waters of San Diego Bay into which nine interceptor sewers discharge. Construction of a $4,250,000 interceptor sewer and a treatment plant is now under way.

"Priming the All-American Canal" was the subject of a paper by L. J. Foster, construction engineer, U. S. Bureau of Reclamation, Yuma, Ariz., which discussed problems of silt disposal and the observations on test wells during a 45-day priming test. This canal is now supplying 55 to 60 per cent of the irrigation needs of Imperial Valley and plans are under way for development of 71,000 hp. in power drops. In discussion, M. J. Dowd, chief engineer and general superintendent, Imperial Irrigation District, described the effects of the 1940 earthquake on this canal and said the stresses in the underground rock structure must have been enormous to cause an average 14-ft. displacement at the surface of an alluvial fill 1,000 ft. deep.

E. B. Debler, hydraulic engineer, U. S. Bureau of Reclamation made a plea for more study of losses from irrigation canals. Such information as is available, he said, is not reliable because of poor gaging methods. Economy and conservation are both involved. Treatments suggested were clay blankets or lining with paving materials. Some experiment has been made with chemical treatment of natural materials.

F. D. Pyle, hydraulic engineer, city of San Diego, said surface water hardness in his county averages about 100 as compared to 2 to 5 times that hardness in ground waters. Conditions here are such that reservoir water does not have a seasonal turnover and evaporation from reservoirs equals the amount withdrawn into the distribution system. Water use in the county is about half for irrigation and half for purely domestic use.

Francisco Gomez-Perez, civil engineer, National Irrigation Commission, Mexico City, described historic flood and irrigation works in old Mexico. In 1503, he said, the town of Salamanca was laid out in an arid section, the first settlement dependent wholly upon irrigation. An aqueduct 33,000 ft. long was built in 1560 and much irrigation and flood-control work was done prior to 1700.

California's freeway policy was described by Fred J. Grumm, Division of Highways, Sacramento, who stated that some 125 mi. of state highways have been designated freeways under a 1939 law defining such routes as roads to which access from abutting property is limited or prohibited. Cost of purchase of access rights on new locations has been small, averaging only $4,000 per mile of highway. This is preventing the formation of "ribbon cities" or "shoestring strips" and when started in this way the artery can be developed into a superhighway later as funds are available.

National defense highways, according to L. I. Hewes, Public Roads Administration, San Francisco, should include 3,000 mi. of access roads to some 300 new military, naval and industrial plants as well as the correction of deficiencies in the 78,000 mi. of the strategic network (substandard bridges, light surfacing and narrow shoulders). This work is estimated to cost $458,000,000.

California's portion of this work, according to R. H. Wilson, Division of Highways, Sacramento, involves 260 mi. of roads and includes 49 projects estimated at $40,000,000. Plans for 23 of these projects, to cost $12,000,000 have been completed and work can be started when funds are available.

Soil mechanics and foundations

Under the subject of "Seepage and Drainage in Earth Dams" there was discussion of the theoretical background for seepage equations and computations, equipment for the observation of seepage and the results of seepage observations in existing dams. F. F. Smith, senior engineer, U. S. Bureau of Reclamation, urged that too much importance not be placed on the plineatic line or line of saturation as its location has very little bearing on the stability of the structure. Data on pore pressures, he said, indicate that critical stresses and minimum factor of safety occur during construction and that construction procedure is more important than seepage studies.

In a paper on "Soil Compaction and Stabilization" Spencer Buchanan, engineer, Mississippi River Commission, Vicksburg, Miss., reported on research directed toward ascertaining the relationship of shearing strength, consolidation and permeability to degree and method of compaction. W. J. Turnbull, Ogallala, Nebr., pointed out the futility of many classifying soil tests as is so often done at great expense.

Construction of cast-in-place foundations to resist uplift in transmission towers was described by Kenneth A. Reeder, Los Angeles, and discussion by A. R. Stuckey, Upland, Calif., showed how this method, on a second transmission line, had resulted in a cost saving of 38 percent as compared to the first power line from Boulder Dam on which ordinary methods were used.

Reclamation can provide all western power needs

Secretary Ickes and the Bureau of Reclamation last week declared that the bureau could provide all the power which will be needed for the defense program in the area west of the Mississippi. Testifying before a Congressional committee investigating Western resources, Acting Commissioner Bashore said that the bureau could install as much as 9,000,000 kw. of power additional to present schedules by 1947, which would provide 4,025,000 kw. of firm power. It was not proposed that this entire program be carried out, but that from it projects could be selected to meet the 2,450,000-kw. power deficiency which is predicted in the West by 1946 if defense expenditures rise to $36,000,000,000 a year.

The project list emphasizes hydro power but includes a half dozen large steam plants. Cost, before any allocations to flood control, irrigation, or the like, averages a little under $300 per installed kilowatt.

Significance of the list is decidedly indefinite. A backstairs struggle is underway within the administration as to who shall administer the expansion of power facilities arising from the defense program. Secretary Ickes is anxious to get the job and was at one time believed to have presidential support. The OPM however has set up a power division under TVA power manager J. A. Krug which, in cooperation with the Federal Power Commission, is working out its own program. A list of proposed projects issued by the FPC was presented in *ENR*, July 24, p. 137.

Bashore's program uses substantially the same estimate of need as that put forward by the FPC. It includes about the same steam plants, but would have them publicly owned rather than privately as proposed by the commission. It suggests rather different sites for hydro development and is a much broader list. This program may thus be seen as a bid for assignment of at least the western phase of the power program.

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Bankhead Tunnel revenues reach new high record

Revenue received to date from operation of the Bankhead Tunnel under the Mobile River at Mobile, Ala., has reached a new high record and is two years ahead of anticipated income. The Mobile City Commission has voted to place $25,000 of tunnel profits into a sinking fund for retirement of bonds. Wayne F. Palmer, maintenance engineer for the tunnel, states that after the $25,000 bond investment is made a surplus fund of $10,000 will remain in the tunnel operating fund.

OBITUARY

Robert Thomas Hill, principal geologist of the U. S. Geological Survey from 1886 to 1930, died July 28 at Dallas, Tex. During his service with the government, he studied the geology of Mexico, Central America, and the Panama Canal route and, in association with Alexander Agassiz, of Harvard University, explored the strata of the American-Caribbean region. He was 82 years old.

Clarence L. White, pioneer Seattle civil engineer, died July 15 at Seattle, Wash. Mr. White was a graduate of the University of Washington.

James Reed, naval construction engineer, died July 23 at Philadelphia, Pa. Mr. Reed was general manager of the Golden Gate Bridge and Highway District at San Francisco from 1933 to 1937. He was a graduate of M.I.T., holding a master of science degree. At the time of his death, he was president of the Cramp Shipbuilding Company.

Randall E. Cross, 85, civil engineer, died at Burlington, N. J., July 20.

Harry A. Smith, 50, city engineer and superintendent of water works, at Port Clinton, Ohio, died July 22. He was a graduate from Purdue University and had served as engineer of Ottawa County before taking over his duties at Port Clinton.

George H. Hodges, 43, widely known Ashtabula pipeline and ditching contractor, died July 21, at Ashtabula, Ohio.

Jacob Gruber, Sr., 89, general contractor, died July 21 at Johnstown, Pa.

H. F. Lassen, construction engineer, died July 18, at Laguna Beach, Fla. Mr. Lassen was a resident of Birmingham, Ala.

George Winters, 84, pioneer bridge contractor of Iowa, died recently at Traer, Ia.

William Letwinik, 58, excavation contractor, died recently at Minneapolis, Minn.

James F. Houseman, builder of the St. Charles Bridge, the old St. Charles Railroad and the Kirkwood-Ferguson line, died July 20 at St. Charles, Mo.

Glenn H. Montford, 52, engineer, died July 19 at La Crescenta, Calif. Mr. Montford had been engaged in engineering work in Russia for many years, having recently just returned to the United States.

Frank R. Olds, 58, well-known in the culvert engineering field, died recently at Rapid City, S. Dak.

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Work to start next month on Clearwater Dam

Work orders have been issued by the U. S. Engineer, Little Rock, Ark. district office, for construction of the second phase of the Clearwater Dam project on the Black River near Piedmont, Mo. Excavation for the spillway and construction of the embankment will be under way early next month. The present work involves an expenditure of about $2,790,000.

The dam will be a roll-fill type containing more than 5,000,000 cu.yd. of earth, and will be 4,300 ft. long, 600 ft. wide at the base, and 150 ft. high. The reservoir to be formed by the dam will have a total storage capacity of 413,000 acre-ft., of which 22,000 acre-ft. will be for a permanent conservation pool.

Major T. F. Kern is U. S. district engineer at Little Rock, Ark., under whose jurisdiction the Clearwater dam is being constructed, and Mittry Brothers Construction Co. are contractors.

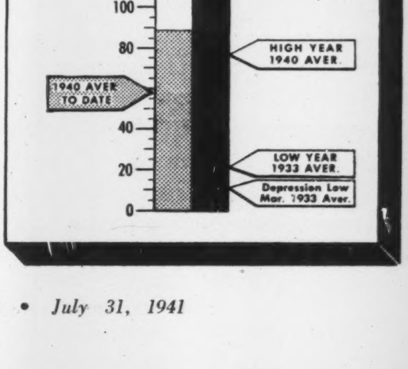
CONTRACTS AND CAPITAL

Engineering Construction awards for the week, $173,094,000, reached the fifth highest peak of the year, 93 percent higher than in the corresponding 1940 week, but 16 percent below the near-record level of a week ago.

Public construction tops the week a year ago by 110 percent, but is 17 percent under last week. Private awards are up 4 percent compared with last year, but 2 percent under last week.

The week's volume brings 1941 construction to $3,800,066,000, a 108 percent increase over the total for the 31-week period in 1940. Private awards, $820,760,000, are 45 percent higher than last year, and public construction, $2,979,306,000, is 136 percent above a year ago due to the 420 percent gain in federal work.

Public building awards, $101,818,000, are at the fifth highest peak of the year, but are lower than a week ago. Waterworks, bridges, commercial buildings, and streets and roads increase over last week; and waterworks, public buildings, earthwork and drainage, and streets and roads gain over the 1940 week.



New capital for construction purposes for the week totals $73,716,000, a 247 percent increase over the volume for the 1940 week. This week's new financing is made up of $40,000,000 in federal appropriations for TVA construction, $24,508,000 in RFC loans for defense plant expansion, and $9,208,000 in state and municipal bond sales.

New construction financing for the year to date, $5,007,275,000, tops the $1,721,063,000 reported for the 31-week period last year by 191 percent.

CONTRACTS

(Thousands of dollars)

	Week Ending Aug. 1 1940	July 24 1941	July 31 1941
Federal	$29,436	$173,621	$126,855
State & Municipal	45,778	17,034	31,272
Total public...	$75,214	$190,655	$158,127
Total private..	14,388	15,222	14,967
TOTALS	$89,602	$205,877	$173,094

Cumulative
1941.... (31 weeks)......$3,800,066
1940......(31 weeks)......$1,827,070

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1940 31 weeks	1941 31 weeks
NON-FEDERAL	$937,491	$939,886
Corp. Securities....	112,664	281,570
State & Mun......	533,620	304,035
U.S.H.A. loans.....	99,058	30,399
R.F.C. loans.... ..	8,149	60,382
R.E.A. loans........	....	100,500
Federal Aid—Hwy..	184,000	163,000
FEDERAL	$783,572	$4,067,389
TOTAL CAPITAL....	$1,721,063	$5,007,275

FHA MORTGAGES

	Week Ending July 27 1940	July 19 1941	July 26 1941
Selected for appraisal ...	$27,054	$32,376	$30,509*

Cumulative
1941......(30 weeks)......$874,463*
1940......(30 weeks)......$739,338

* Subject to revision.

ENR INDEX NUMBERS

Index Base=100		1913	1926
Construction Cost..	July '41..	258.18	124.11
Building Cost.....	July '41..	210.22	113.64
Volume	June '41..	492	216

EDITORIALS

VOLUME 127 NUMBER 5

July 31, 1941

A Thorn Removed

IT SEEMS HIGHLY APPROPRIATE that one of the last things done by American Engineering Council was to lay the groundwork for removing a thorn from the flesh of the engineering profession that had been a source of annoyance since before the council was formed—elimination of the so-called "American Society of Engineers." Because of his experience with the Post Office Department, L. B. Lent, last executive secretary of the council, was successful where others had failed in getting the department to exclude from the mails the appeals of Fred Gross, perpetual president of the alleged society. That Gross was able to keep the racket alive for so many years and to get enough men to pay in enough in dues or initiation fees to make it worth his while appears as no compliment to the engineering profession, yet it is quite probable that few of those who did contribute could properly be classed as engineers. Qualification for this title worried Gross not at all so long as a $5 or $10 money order came along with the application blank.

Simplified Soil Classification

THE SYSTEM of soil classification described in this issue brings to mind again the need of simplification in this important prerequisite to a practical application of soil mechanics in engineering. One after another investigating agency in the new science has developed an individual soil classification until now one hardly knows what the other is talking about. No real coordination of the accumulating knowledge of the behavior of soils under load can come about until this confusion of tongues is corrected. This is the task of the committees of the American Society of Civil Engineers and the American Society for Testing Materials now working on soil classification. For them to bring out merely additional classification methods is to do nothing adequate to the situation. They must manage an agreement on a method. It is probable that the method for the present must be tentative but this at its worst will be better than the present multiplicity of methods. And finally it may be said, if one says no more, that the discussion in this issue wisely urges that in soil engineering something more is needed than a classification that represents only difference in soil grain size. As an earnest attempt to develop such a classification the present discussion has definite value in current soil research.

Administrative Genius

AS THE Colorado River Aqueduct project stemmed from the vision of William Mulholland, in finished form it represents the organizing and administrative genius of F. E. Weymouth, who died last week only a short month after this great water supply undertaking had been completed. Few engineers are permitted to leave behind them a monument that so fittingly represents the culmination of a long career in a chosen field. Bringing to the Metropolitan Water District of Southern California a wide experience in storing and conveying water under conditions peculiar to the arid West, Mr. Weymouth skillfully directed the staff of engineering and construction specialists needed for the $220,000,000 project through his peculiar faculty for selection and coordination of personnel. It was his ability to appraise, organize and direct men in staff participation, that is the notable characteristic of his work. For genius of engineering management his name will go down as one of the builders of the West.

Coercion in High Places

NOTHING IN THE RECORD made by the construction industry in carrying out the first cantonment program justifies the coercion that the War Department is now applying to engineers and contractors who seek contracts for the new work. To get these contracts they must sign away all claims they might have against the government over and above the fixed fee of the previous contract. If anything, the record indicates that quite the opposite ruling should be in effect, for the War Department admittedly underestimated the costs on which most of the fixed fees were based. Due to these underestimates and to other causes such as are common to any job of the magnitude of the defense construction operations the contractors have claims that in all fairness should get an impartial hearing. For the War Department to set a waiver of these claims as the price of an opportunity to be considered for contracts on the new work now coming up moves the crime of coercion to a high seat in government. Just think of the righteous indignation in Washington should the same contractor be found using similar tactics with a subcontractor!

Labor Aids Defense

By agreeing to waive some of the widely accepted rights of organized labor when engaged on defense contracts the building trade unions of the American Federation of Labor have made a notable contribution to the defense program and have set an example that other unions will find it difficult not to follow without loss of public esteem. Last week's agreement between the AFL and the Office of Production Management not only gives reasonable assurance of no strikes on buildings for defense, it also gives contractors the assurance of stability in labor conditions during the prosecution of a job. Closer, safer bidding and lower defense costs should result.

Basically the agreement is a bar to strikes that would hamper defense construction. All disagreements that cannot be settled by direct negotiation between contractors and the representatives of labor are to be referred to a board whose finding will be binding on both parties. Work is to continue during negotiations. Punitive overtime is eliminated, overtime is to be paid at time and one half, and a three-shift day is permitted without penalty rates for the second and third shifts.

Most important in controlling costs is the provision that wage rates in effect at the start of a job will be applied through the life of the job up to one year. Uncertainty as to where wage rates may go in the next few months after submitting a bid forces contractors to protect themselves by using high contingent items. Also important is the provision for extension of the principle of predetermining wage rates. Coupled with the one-year fixation clause, this clause should take much of the guesswork out of bidding on defense projects.

Wrapped up in the Flag

A program calling for the annual addition of over three and one-half million kilowatts to the nation's power resources during the years 1944 to 1946 was laid before the President by the Federal Power Commission on July 16 as being essential to the orderly execution of the defense program. More than one-third of this would be federally-financed-and-built hydro stations and the remainder would be steam plants, built principally by the private electric utilities.

The significant thing about the FPC program is that it not only calls for the addition of 2,500,000 kw. in 1943 but also contemplates the addition of new power-producing equipment at the abnormal rate of over 3,500,000 kw. per year in the years 1944, 1945 and 1946. Is our defense program going to be still expanding in 1943 at a rate that calls for that much more power each year for three more years?

We cannot believe that such is the case. It is almost axiomatic that before 1943 we must be meeting the needs of defense by drastic curtailment of the production and consumption of products not essential to defense if we are to avoid runaway price inflation. That such reduction will more than offset any continuing increase in power needs by 1943 appears obvious. Consequently, the Federal Power Commission's program looks more like a move to saddle the country with a great increase in federally owned power plants under the guise of meeting defense needs than like a program designed to meet real defense requirements.

True, building these plants would provide a large amount of work for the construction industry at a time when private and public work of a non-defense nature will be at a low ebb, but if their construction will only serve to make the post-war depression worse, they can hardly be justified. A minimum of fluctuations in the business cycle is essential to the health of the construction industry.

Today citizens are asked to put the needs of defense ahead of their personal or group welfare. Under such circumstances, the Administration and its agencies should be most careful to avoid even the appearance of using national defense to advance their pet hobbies. Yet the Federal Power Commission has no such compunction. It takes all the Administration's pet water power projects, supplements them with a very plausible looking list of steam stations to be built by private electric utilities, wraps them in the flag and presents them as necessary to national defense.

If J. A. Krug, the newly appointed OPM Coordinator of Defense Power, will only strip the flag off this package when it arrives on his desk he will be putting deeds behind his appeal to the electric utilities to push old controversies into the background. Certainly, by asking the utilities to accept its vast program of public power development as a patriotic duty, the Federal Power Commission has pushed the oldest controversy—public vs. private power development—right up into the foreground.

ENGINEERING NEWS-RECORD

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Passing Faults on the Delaware Aqueduct

***Contents in Brief**—Fault zones were encountered and successfully passed at several points on the new Delaware water supply system for New York City. Bad rock and water conditions, and the means devised to pass them are an important part of the construction of the Delaware Aqueduct.*

WATER PRESSURE up to 290 lb. per sq. in., mud and muck forced into the tunnel in 1,000-yd. lots by inrushes of water and other similar difficulties kept tunneling from becoming monotonous on the Delaware Aqueduct. Longest tunnel of all time, the 85-mile aqueduct will carry water from the west slope of the Catskills to New York City through a concrete-lined pressure waterway 300 to 2,000 ft. below the surface. In selecting the route for the tunnel, careful consideration was given to avoiding as many as possible of the known fault zones and areas of porous rock (*ENR*, April 25, 1940, p. 584), but it was neither economical nor practicable to bypass all of them. The crushed and decayed zones encountered have increased the cost of tunneling, but will not delay scheduled completion as all major faults were anticipated and ample time allowed for slow construction through them.

The work is being done under competitive bid contracts that total more than $178,000,000, including the construction of Merriman Dam. Tunnel construction is under twelve principal contracts, varying from $10,000,000 to more than $21,000,000.

Rondout Creek at Wawarsing

Farthest from New York City and greatest in delay to tunneling is the water-bearing rock structure under the Rondout valley at Wawarsing. Thoroughly inundated glacial drift consisting of sand, gravel, boulders and clay overlies the rock bed to a depth of over 400 ft., with a minimum depth of rock cover of 260 ft. over the tunnel itself.

PREVIOUSLY PUBLISHED ARTICLES ON THE DELAWARE AQUEDUCT

A Billion Gallons Not Enough	Apr. 11, p. 513, 1940
Routing the Tunnel	Apr. 25, p. 584, 1940
Designing the Aqueduct	May 9, p. 656, 1940
Access to the Aqueduct	June 6, p. 797, 1940
Controlling the Flow	July 18, p. 109, 1940
Driving 85 Miles of Tunnel	Aug. 29, p. 288, 1940
Tunnel Haulage and Hoisting	Sept. 26, p. 419, 1940
Reservoirs and Dams	Nov. 21, p. 688, 1940
Caissons for a Cutoff Wall	Dec. 5, p. 761, 1940
Treatment for Delaware Watter	Dec. 19, p. 822, 1940

In the immediate vicinity the rock structure encountered in the tunnel consists of the Helderberg limestone series, Manlius limestone, Binnewater sandstone and High Falls shale; there follows the Wawarsing wedge, a new formation not encountered previously; and finally the line enters Shawangunk grit which underlies the southerly half of the Rondout gorge. This last formation consists of a very hard sandstone and conglomerate formation in which no structural difficulties are expected, but which has not yet been penetrated except by exploratory borings. In the section between the Helderberg limestone series and the Shawangunk grit, about 500 ft. along the tunnel axis, serious difficulties with water are being met due to the porous condition of the rock.

As the heading neared the vicinity

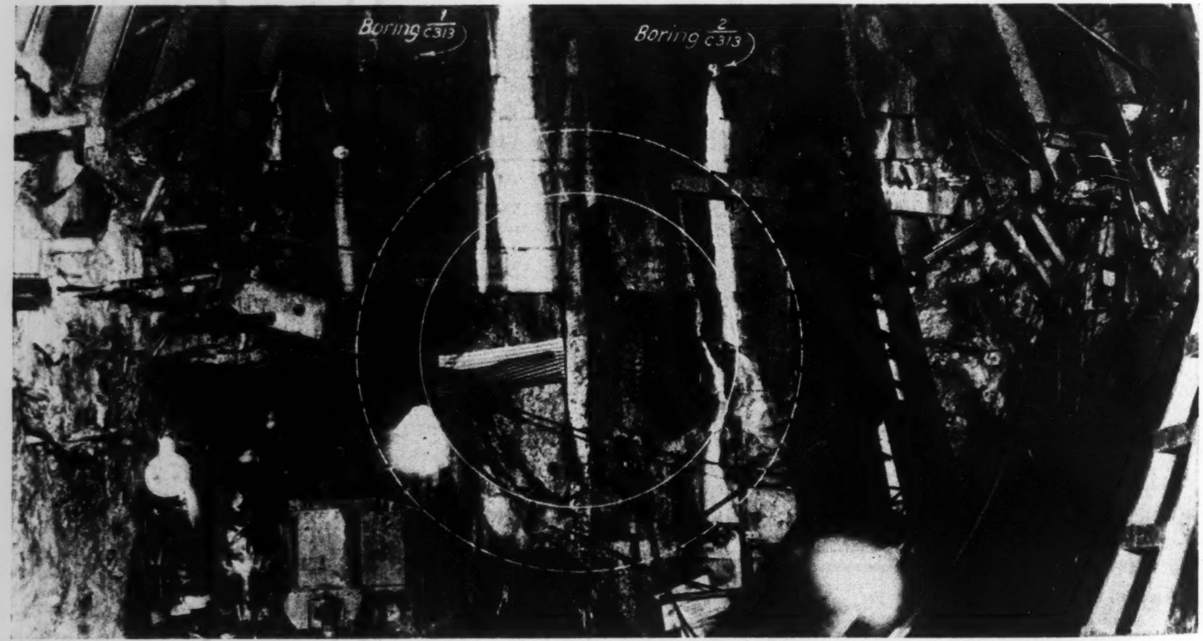


Fig. 1. Under Rondout Creek at Wawarsing the drift at lower left was unsuccessful and the circular drift outlined by the white lines adopted to permit radial grouting. Full face heading has been advanced about 200 ft.

in which leakage was anticipated, test holes were advanced ahead of each round and grouting equipment prepared so that when test holes encountered inflows of 400 gpm on June 18, 1940, this was immediately grouted and the inflow successfully stopped with 6,159 bags of neat cement grout. The heading was advanced 175 ft. farther into the Manlius limestone and on June 29 test holes again showed considerable water with grouting only partially successful. A concrete bulkhead was constructed against the face with 4-in. pipes embedded to facilitate drilling and grouting. Additional pumps were installed to a total capacity of 9,500 gpm expected to give a dependable continuous discharge of 5,000 to 6,000 gpm. Diamond drilling was continued until flow became excessive and then grouting done to refusal, pressures up to 1,000 psi. being used. Usually the same hole was re-cored and advanced further until again necessary to grout. One hole was carried through to the Shawangunk grit by Oct. 2, a distance of over 500 ft. A total of more than 5,000 ft. of such holes was drilled, most of them 70 ft. or less in depth. These were grouted to consolidate the ground using a 10x3x10-in. grout pump and consistencies ranging from 16 to 45 gal. of water per bag of cement used in neat cement grout.

Despite the grouting, the static pressure of the water remained at 290 psi. indicating definitely the level of the Rondout Creek. Flows before grouting an individual hole generally reached 1,000 gpm. and in some cases were as high as 1,500 gpm. One hole was allowed to run steadily at 1,000 gpm. for five days with no diminution noted in that time and an additional inflow of 1,300 gpm. penetrated in another boring about 10 ft. distant had no appreciable effect on the 1,000-gpm. flow.

The contractor elected to construct an 8x8-ft. drift in the lower left quadrant of the tunnel and this was advanced about 87 ft. unlined and without support. The leakage at this point gradually increased until it aggregated 1,200 gpm. and test holes ahead showed an additional 900 gpm. A concrete bulkhead 26 ft. thick was placed to seal this drift completely and low pressure grouting was attempted, but it was not successful. The drift was abandoned and refilled solidly with concrete, all grout pipes and drains being carried back to the face. The flow through this section was permitted to run freely for six weeks with no apparent diminution.

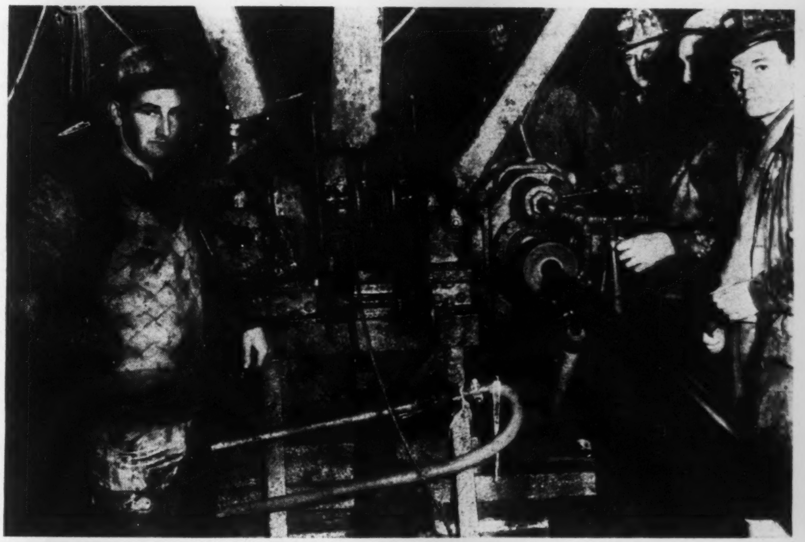


Fig. 2. Diamond drill machine on horizontal borings in water-bearing rock. Maximum distance drilled at this point was 500 ft., static water pressure was 290 psi., and about 2,000 gpm. flowed from a single hole.

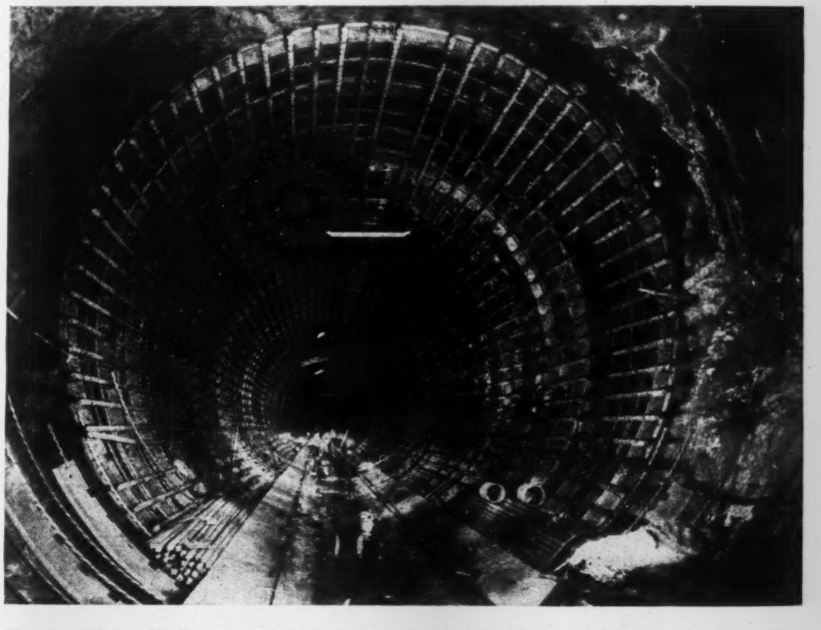


Fig. 3. A 1-in.-thick steel plate interline, 16 ft. 4 in. O.D., with concrete lining to 13 ft. 6 in. will be placed inside the heavily reinforced outer concrete lining through a faulted Wappinger limestone section just west of the Hudson River.

Another plan is now being used consisting of a circular center drift, concrete-lined to a finished diameter of 7 ft., with a minimum thickness of 18 in. of concrete. The axis of this drift is on the tunnel center line and 3 ft. below the springing line at the start, sloping upward on a 1-percent grade for drainage of the inflow.

This drift permitted embedding a series of 3-in. pipes radially in the lining in rings 4 ft. apart and 14 pipes to the ring, for radial drilling and consolidation with grout of the entire area eventually to be excavated. By this method the drift has been advanced 223 ft. through the Binnewater formation and drilling and grouting are now in progress in alternate pipes in alternate rings. This has given sufficient solidification to the surrounding rock structure that the full face heading has been advanced about 200 ft. at this time. Extension of the center drift beyond the 223 ft. is not contemplated as borings indicate better going ahead. About 675 ft. of watertight steel plate interlining, concrete-lined and surrounded with heavily reinforced concrete, will be installed at this point.

The contractor on this work is Samuel R. Rosoff, Ltd., of New York City, for whom Fred Stiefel is in general charge of the work.

Trouble just west of the Hudson

A fault zone in Wappinger limestone was expected to intersect the tunnel at a point just west of the Hudson River, with faulty rock and a large flow of water anticipated. At one point in this area 1,800 gpm. flow was encountered but grouting reduced it to 240 gpm. without serious delay or difficulty.

At a point about 850 ft. west of the westerly shore of the Hudson an inflow of about 700 gpm. was encountered. The first flow encountered had a muddy appearance and washed about 25 yd. of coarse sand material into the tunnel. A program of alternate drilling of test holes and grouting was carried out, using cement with water content of from 40 to 60 gal. per bag and pressures as high as 1,000 psi.—without success.

Diamond drills were used for exploratory borings. A hole in each quadrant of the tunnel was made, varying in depth from 141 to 310 ft. These borings passed through about 25 ft. of fairly hard limestone after which the rock encountered was mostly a disintegrated limestone and for a stretch of more than 100 ft. no core at all was obtained. Upon completing the boring the total inflow was about 1,600 gpm. at a pressure of 240 psi., a pressure head equivalent to the distance the tunnel lies below the Hudson River.

The contractor's plan for excavation called for driving five drifts above the invert and outside the perimeter of the tunnel. In each of the lower drifts, a substantial concrete wall was to be built with the top above the springing line of the completed structure to carry a 5-piece roof support.

Preliminary to starting the drifts, the tunnel back of the heading was enlarged and from this face the excavation of a bottom drift about 7 ft. square was started at each side. The rock in the drifts was supported on timber bents. In advancing the drifts, the headings were drilled and shot with light charges. In about a month's time the headings were advanced 214 ft. each and it was decided that the type of rock encountered was sufficiently good to permit removal of the full section without driving the three additional drifts originally proposed. A concrete side wall was constructed in each drift and the water was permitted to flow freely to relieve all pressure, the inflow soon becoming stabilized at about 1,500 gpm. Excavation of a full face heading, with supports set on the concrete side walls, was carried forward without difficulty by keeping the supporting steel close to the heading. The final construction through this stretch of bad ground included a steel interlining with heavy reinforcement of the outer concrete lining extending for 1,106 ft.

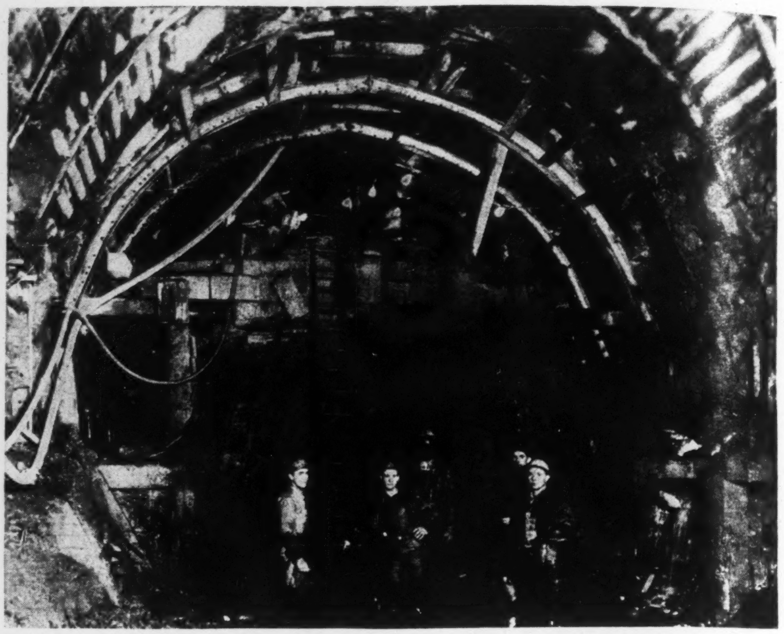


Fig. 4. The Eastview fault was penetrated by small side and top drifts, followed by removal of the cores.

The contractor on this section of the work is the Pleasantville Constructors, Inc., of Chelsea, N. Y., J. A. Glaeser, superintendent.

The Deans Bridge Road fault

South from Shaft 11 the topography and surface features indicated the presence of a fault. Seven core borings were made from the surface, four being vertical and three inclined. The cores indicated a narrow belt of limestone injected with pegmatite and aplite that had been squeezed between two blocks of schist and in part crushed. Groundwater circulating through the crushed rock decayed it to a mass of rock fragments, disintegrated sand and clay.

The full-size tunnel was driven 73 ft. into the limestone when test holes into the face found an inflow of 30 gpm. coming from a point 16 ft. ahead of the face. A top center heading was driven an additional 6 ft. and test holes in this drift found the water, the inflow washing in a quantity of silt, sand and rock fragments. This flow was sealed by extensive grouting. A 5x6-ft. drift was begun on each side of the tunnel, placed 9.5 ft. from the tunnel center and 1 ft. above the springing line. Inflows, encountered at 52 and 34 ft. respectively in the east and west drifts, indicated the desirability of a concrete bulkhead and grouting ahead. Excavation of the drift was then resumed, an inflow of 800 gpm. being encountered at one point, but the flow soon lessened to 20 gpm. The east drift was driven 75 ft. south of the full face heading into sound limestone and then turned in a U across the tunnel and returned on the west drift. Total water amounted to above 50 gpm. in each section of the drift. Wall plates were set, the core removed in $1\frac{1}{2}$ and 2-ft.

advances, and 8-in. steel ribs set with lagging on the upper flanges. Steel reinforcing rods were then set between the ribs and encased with shotcrete, then the bench was removed and a concrete wall constructed under each wall plate. Full face excavation was resumed on April 16, 1940, after having been halted on Dec. 30, 1939.

The Purdy Lake fault

The tunnel being driven north from Shaft 12 passed into a Manhattan schist formation which gradually became slabby and jointed, the tunnel becoming wet. While mucking out a shot on Aug. 10, 1939, an inflow of disintegrated and decayed rock approximately 1,000 cu. yd. in volume and a large inflow of water came into the tunnel.

A timber bulkhead was erected 26 ft. back of the face and part of the muck excavated and a timbered top drift begun. This was advanced only 10 ft. when on Aug. 15 another inflow of decayed rock and water occurred, breaking the timber bulkhead and filling the tunnel back 56 ft. from the face. A 16-ft. concrete bulkhead was then constructed about 75 ft. back from the face and borings made through it into the fault zone supplemented by one boring from the surface, drilled on an incline. Several of the borings encountered large flows of water at high pressure but both volume and pressure diminished as the flow continued.

When the head had dropped to 15 psi., side drifts were begun in hard rock and driven outward at an angle until 25 ft. from the center line of the tunnel and then parallel to it. These were carried by soft-ground methods through the fault zone and into the hard rock beyond it. A top center drift was driven in the same manner, widened out and steel ribs erected on 2-ft. and 4-ft. centers, supported by wall plates resting on the soft material. Support of the steel ribs was transferred to 18-in. needle beams 30 ft. long with one end carried on the bench and the other by posts reaching to the invert, the bench being removed in short lengths, wall plate posts inserted, and the wall plates underpinned with concrete walls.

At both the Deans Bridge Road fault and the Purdy Lake fault, watertight steel plate interlinings surrounded with heavily reinforced concrete, 320 and 440 ft. long, respectively, have been installed. Both faults were on the contract of the Utah Construction Co., for whom Gus Ayers is job manager and Ben Arp superintendent.

The Armonk fault

The tunnel being driven north from Shaft 16 was passing from a belt of interbedded limestone into gneiss on March 5, 1940 when soft fault gouge began to squeeze in on one side. The width of the broken and decayed zone was only about 30 ft. measured normal to its trend but it crossed the tunnel at a very small angle so that excavation remained in it for a long distance.

Excavation was carried through this fault by means of wall plate drifts and a top heading. There was inadequate support for the wall plate posts so the bench was removed in short sections and ribs and lagging placed to the bottom of the tunnel, thus forming full circular support. Very little water was encountered and no grouting used, full face excavation being resumed on June 24, 1940, after an advance of 242 ft.

This fault was encountered on the S. A. Healy contract, Myrle R. Miller, general superintendent.

The Eastview fault

Preliminary borings indicated that the tunnel driven south from Shaft 19 would pass from Manhattan schist to Inwood limestone at a point 2,000 ft. south of the shaft, the contact being marked by a fault. On May 17, 1939, the quality of the rock became so poor that a small drift was begun at the west side of the face, penetrating into rock so badly decayed that it resembled a mixture of sand, clay and gravel. This was impervious and did not run but during excavation of the drift a joint opened in the hard schist on the opposite side of the face of the main tunnel and an inflow of 750 gpm. came into the tunnel.

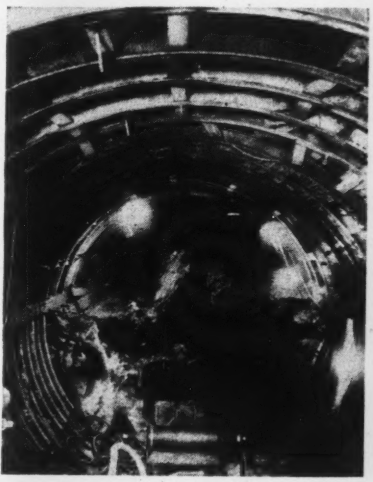


Fig. 5. Full circular steel support was used to pass the badly broken Armonk fault. Little water was encountered.

A 20-ft. concrete bulkhead was constructed 28 ft. back from the face and the intervening space filled with concrete. Pipes were carried through the bulkhead to the rock face for grouting, a total of 64,338 bags of cement being used at pressures up to 900 psi. Borings were made through the bulkhead and indicated that grouting had not sealed off the water so a second grouting was performed using an additional 31,287 bags of cement. Additional borings showed that the grouting had been unsuccessful in stopping the flow.

The original borings were opened up and two additional borings made near the bottom of the tunnel, drilled a distance of 155 ft., passing entirely through the fault zone. At this time the water coming into the tunnel was 550 gpm., which gradually diminished to 150 gpm. while the hydrostatic pressure dropped from 175 to 25 psi.

A 6x6-drift was driven on each side of the tunnel at invert grade reaching hard limestone about 100 ft. ahead of the original advance, and ending 30 ft. farther on. In the west drift a flow of 1,000 gpm. was encountered which lasted for three minutes and was succeeded by several smaller intermittent flows. Later another flow of 1,000 gpm. filled the end of the drift with disintegrated rock temporarily stopping progress. After a few days the inflow ceased, excavation was resumed and carried to completion.

The lower section of a concrete retaining wall was poured for the full length of each drift, then a second pair of drifts were excavated above the first set. Minor difficulties were experienced in one of the upper drifts. The concrete side walls were then carried up full height and wall plates set on them. A top drift was excavated without difficulty, widened out, and tightly lagged roof support set in place. The core remaining between the side walls was then removed. Full face excavation was resumed on Dec. 9, 1931. About 300 ft. of the concrete tunnel lining has been heavily reinforced and given a watertight steel plate interlining through this fault.

Associated Contractors, Inc., E. H. Hatch, general tunnel superintendent, and Les Huntington, shaft superintendent, handled this section of the work.

The Bronxville fault

On October 24, 1938, the tunnel driven north from Shaft 23 encountered a fault in Yonkers granite on the east side of the tunnel and an inflow of 95 gpm. that gradually increased to 198 gpm. A zone of rock 9 ft. wide, crushed and badly decayed to a clay-chlorite mixture, crossed the tunnel diagonally. On each side of this zone the rock was badly jointed and fractured into small pieces with decay in the interstices. A top center drift was driven 68 ft. ahead, then the full face tunnel brought up to within 13 ft. of the face of the center drift. Core drills tapped a small amount of water and the holes were grouted using 87 bags of cement at a maximum pressure of 500 psi.

Wall plate drifts were begun at this point, and continued for 67 ft., the upper part of the face being removed in short sections and steel ribs supported on the wall plates set at each advance. Full face excavation was resumed on Jan. 24, 1939, after an advance of 119 ft. in difficult ground. About 280 ft. of watertight steel plate interlining surrounded by heavily reinforced concrete has been placed across this fault.

This fault occurred on the contract of Shea & Kaiser, Inc., for whom T. M. Price is general manager and Ed Shea superintendent.

Acknowledgment

Material for this article came largely from the following sources: an article on the Rondout difficulty by Max F. Freund, division engineer, appearing in the Delaware Water Supply News Feb. 15, 1941; an article on the fault west of the Hudson by O-Kelly W. Myers, senior division engineer, appearing in the same magazine on March 15, 1941; and information on the Deans Bridge Road, Purdy Lake, Armonk, Eastview and Bronxville faults furnished by Thomas W. Fluhr, geologist of the Eastern Department.

The Delaware Aqueduct was designed and is being built by the Board of Water Supply of New York City, Charles M. Clark, chief engineer, and Roger W. Armstrong, deputy chief engineer.

These three deflectors were built at an average cost of $8,000 each.

Timber Deflectors Prevent Bank Scour

A 700-FT. LENGTH OF BANK along the Eel River near Scotia, Calif., was protected from severe scouring action by the construction last fall of deflectors built of redwood logs taken from the nearby timber stand. Filled with gravel retained by heavy wire mesh, the deflectors were built for a relatively low cost and have provided the desired protection effectively. Need for special protection arose from the fact that the smooth surface of a recently constructed bank revetment so accelerated stream velocity that at the downstream end of the revetment there was a tendency to retard the velocity, resulting in a swift eddy with attendant bank scour.

Excavation for the deflectors was carried 10 ft. below river level. Logs brought to the job for framing had a minimum diameter of 24 in. (average about 27 in.) and were assembled into the crib structures by tractors and power hoists. Galvanized steel drift pins of 1-in. dia. were used at all joints, two being driven through each log to a minimum depth of 12 in., in the log beneath.

In plan the deflectors have a rectangular rear end which forms the base of an equilateral triangle pointed toward the river channel. The rectangular section at the inshore end affords a means for obtaining adequate anchorage in the embankment that carries the highway roadbed.

A lining of No. 9-gage chain wire mesh with 2-in. openings was put in each deflector and the interior was filled with screened gravel of 2-in. minimum size. The wire mesh was lapped 6 in. and tied with 14-gage galvanized wire. Backfilling and the building up of the roadway embankment around the rear end of the deflectors was carried on at the same time that the cribbing was assembled.

The timber deflectors average 38 ft. in overall height, 60 ft. in width and 90 ft. in length. They extend into the river about 100 ft. from the center line of the highway. Some 15,000 lin. ft. of logs were used and the total cost for four of the deflectors (there was one at another location in addition to the three here shown) was $32,000 or an average of $8,000 each.

The deflectors were designed by the engineering department of the California Division of Highways: C. H. Purcell, state highway engineer and Waldo H. Chase, resident engineer on this project.

Bottom course of logs in the point of the deflectors. The point has the shape, in plan, of an equilateral triangle.

Radial Wells for Powder Plant Water Supply

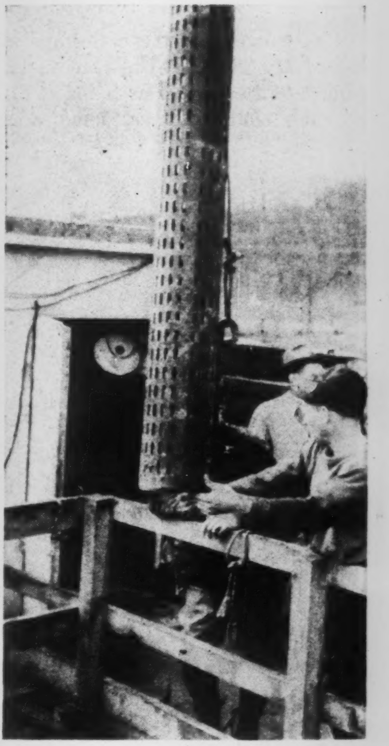
***Contents in Brief**—To provide a water supply in six months for the Charlestown, Ind., smokeless powder plant the War Department chose to construct seven collectors of the radial well type. Work was begun Nov. 4, the first collector was in service March 31, and all collectors were completed in June, when the plant went into operation.*

PERHAPS the largest single groundwater project in the world, a radial well water supply installation, recently went into operation to provide a maximum capacity of 49,000 gallons per minute for the War Department's Charlestown, Ind., smokeless powder plant. This development provides more than triple the capacity of an installation completed in 1937 at Canton, Ohio, for the Timken Roller Bearing Co. (*ENR*, Jan. 6, 1938, p. 25). The latter project consisted of a single 12.5-ft. inside diameter caisson shaft and when completed was considered the largest capacity single groundwater collector or well ever built. At Charlestown seven 13-ft. inside diameter collectors spaced along the Ohio River about 1,800 ft. apart and approximately 100 ft. inland are now in operation.

Radial well construction of the type used at Charlestown is a relatively new development (*ENR*, Oct. 22, 1936, p. 576). The principle on which the system is based involves the sinking of a shaft of suitable design down through the water-bearing strata and projecting slotted screen pipes radially and horizontally at selected levels into the aquifer. A special point at each pipe's outer end permits removal of fines in the path of and around the pipe as it is projected outward and results in exposure of a large screen area in the water-producing material.

At Charlestown, the collectors vary in depth from 80 to 110 ft. with the bottom of each closed by a 7-ft.-thick reinforced concrete plug. Just above this plug—at an elevation of about 50 ft. below mean low water on the Ohio River—10 to 14 slotted screen pipes per collector are driven horizontally into the water-bearing strata consisting of sand and gravel.

Advantages claimed for the radial wells are: (1) economical installation where a large supply is required; (2) fullest utilization of the available groundwater storage; (3) low infiltration velocities, with resultant pressure difference inside and outside of radial pipes being small, incrustation of pipe openings is eliminated and long life of screens assured; (4) a clear water with no treatment required for industrial uses and chlorination only for domestic consumption results; (5) a water with an almost uniform temperature of about 60 deg. F. throughout the year, which is important in manufacturing powder and permits use of the supply as a condenser water without further cooling, will be available; (6) the supply's iron content will be less than 0.01 ppm., which would be impossible without treating the water obtained from ordinary wells extending into the lower underlying strata of high



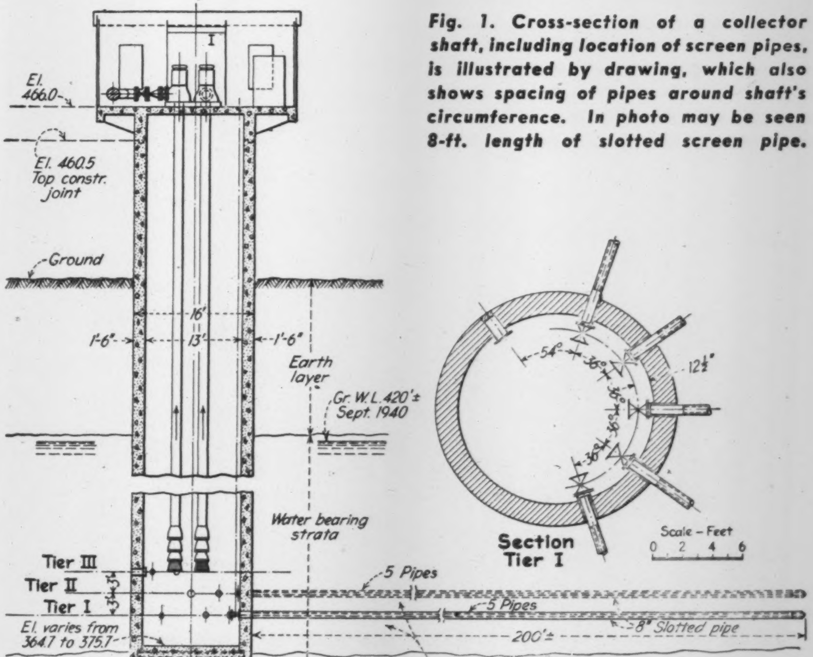


Fig. 1. Cross-section of a collector shaft, including location of screen pipes, is illustrated by drawing, which also shows spacing of pipes around shaft's circumference. In photo may be seen 8-ft. length of slotted screen pipe.

iron content; and (7) capacity of any collector can be increased by driving radial screen pipes through the additional portholes, since any collector shaft can be unwatered by closing the valves regulating the flow from each pipe.

Construction rapid

Construction of the collectors was begun last Nov. 4. The general procedure of the work is as follows: First at each shaft is constructed a 12-ft.-high caisson section of 3,500-lb. reinforced concrete with 18-in. normal wall thickness ending at the bottom in a steel shoe that acts as a cutting edge. In this bottom section are placed eighteen 10-in. portholes through which 8-in. screen pipes will later be jacked. When the concrete of this section is sufficiently cured, the steel forms are removed and excavation is begun inside the shaft with a crane using a ¾-yd. clamshall bucket. This permits the cell to sink of its own weight to a convenient depth for construction of the next 12-ft. section.

Concrete is supplied by truck-mounted mixers. By constructing a section every other day, one of the 90-ft. shafts is built in less than a month. When a shaft reaches the desired depth, a diver places the reinforcing steel for the plug after which he supervises placing the tremie-poured concrete.

Screen pipes jacked into place

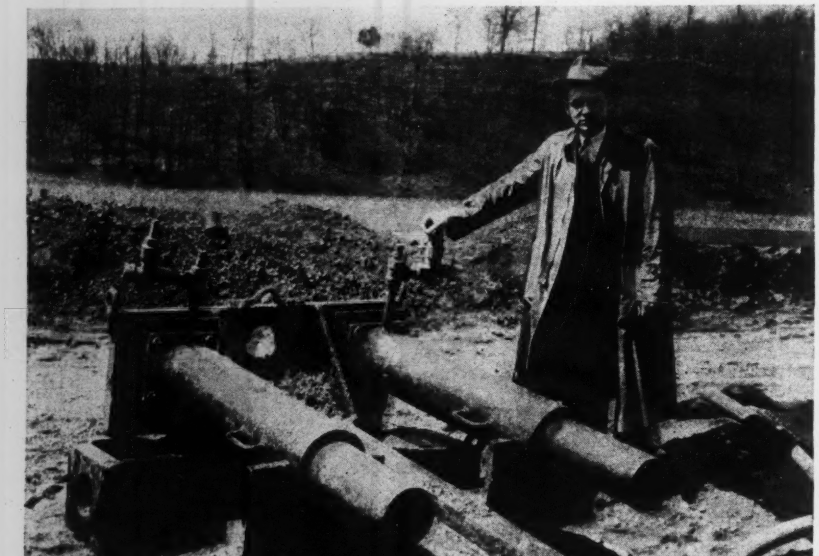
Next comes the job of jacking the screen pipes into place. These are made from ⅜-in. copper bearing steel plate punched flat with 2-in. by ⅜-in. slots. The punched plates are bent into a circle and welded along the longitudinal joint to form an 8-in. inside diameter pipe. About 1,280 ft. of this pipe is required for each collector shaft.

A hollow cast-steel conical point of patented construction is welded to the outer end of the first section of each radial pipe to be driven. A welded-in-place diaphragm closes the open end of the point except for a 2-in. opening at the center. The latter permits insertion of a removable pipe of the same diameter to extend from the diaphragm along the axis of the slotted screen pipe and through a packer and a jack frame.

As jacking starts, a valve is opened in the 2-in. line to permit fine sand and gravel to flow from in front of the driving point, through the inner pipe, packer and jack frame into the bottom of the well. The fine material may be removed from in front of the driving point at the rate of 7 cu.ft. per foot of advancement. On the Charlestown work the average production of fine material is about 4 cu.ft. per foot of advancement of each screen pipe. This creates a gravel pack of 3 to 6 ft. in diameter with the slotted pipe at the center.

Only one screen pipe is driven at a time from the bottom of any shaft, and the driving is accomplished by means of the two 6-in. 100-ton hydraulic jacks shown in Fig. 2. The jack rests against the wall opposite the porthole through which the pipe is being extended. The longest screen pipe used on the Charlestown work is 257 ft.

With a normal crew of three workmen and a foreman, on the Charlestown job between four and five 8-ft. sections of screen pipe are driven during each 8-hr. shift and as high



Figs. 2A and 2B. Screen pipe is jacked into place by means of the two jacks shown at top. Jacks pushing pipe outward from bottom of shaft by means of a U-frame shown below. Latter view also shows 2-in. pipe extending through frame to allow for disposal of fine material from in front of pipe's outer end.

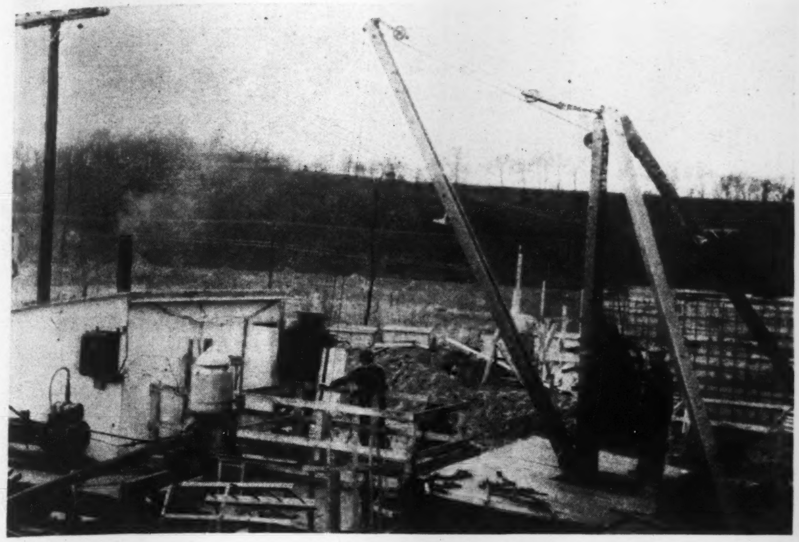


Fig. 3. As needed, 8-ft. sections of screen pipe are lowered to bottom of shaft by hand-operated stiffleg derrick. Electrically-driven centrifugal pump for keeping shaft unwatered is shown at left of shaft, as is pump for hydraulic jacks operating at shaft's bottom for pushing screen piping into place.

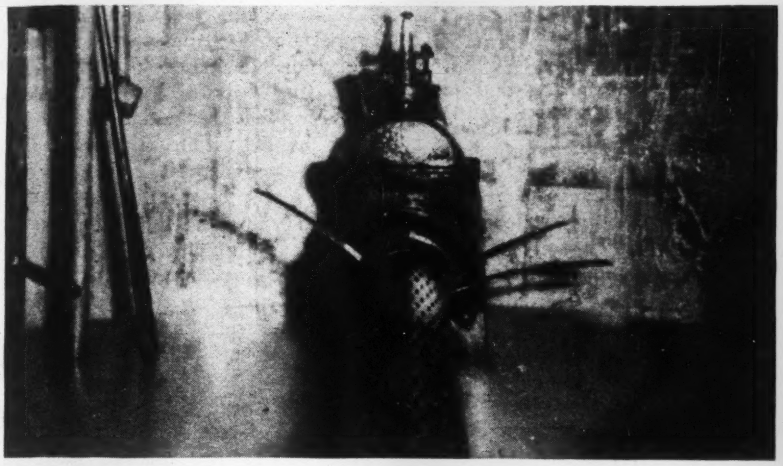


Fig. 4. Screen pipes are jacked outward horizontally through 10-in. portals near bottom of shaft. Steel bars extending radially from this pipe are to prevent displacement of temporary packing around pipe. They are removed and put in slots nearer the reader as jacking progresses. At each portal a permanent valve such as that shown makes possible control of flow from each screen pipe.

as eight sections have been installed in an 8-hr. period. General procedure is to keep two men at the bottom of the shaft operating the jack and one man at the top to lower new sections by means of a hand-operated stiffleg derrick. The top man also must keep running the 40-hp., 600-gpm. pump that keeps the shaft unwatered, as well as the hydraulic pump for the jacks. In addition two workmen travel among the seven shafts to do the welding of all sections. Three 8-hr. shifts are employed and work continues Saturday and occasionally Sunday.

All collectors are built up to 46 ft. above normal stage of the Ohio River to bring the top of the collectors several feet above the surrounding ground and one foot above the 1937 flood level. Each shaft is to be surmounted by a 19x30-ft. machinery house with a reinforced-concrete floor, steel frame, and walls and roof of asbestos siding. The house will rest directly on the caisson walls with the additional floor area desired obtained by cantilever construction.

Each machinery house contains two 20-in., 3,500-gpm., 5-stage, 450-hp. electrically driven centrifugal pumps. Near each well is being built a substation to reduce the available 3-phase, 60-cycle current from 11,500 volts to 2,300 volts for operating the pumps. Discharge is directly into two 36-in. cast-iron mains leading to the powder plant.

Construction of the shafts and installation of the screen piping were carried out by the Ranney Water Collector Corp. of New York, licensees of Leo Ranney, holder of the patents. E. W. Silitch was project manager and Donald Kresin was superintendent for the Ranney Corporation. The work was done under a subcontract with the E. I. du Pont de Nemours & Co., Inc., general contractor with the War Department for the powder plant. DuPont constructed the machinery house and the power substation at each shaft.

Bomb Resistance of Steel and Concrete Buildings

Steel-frame and concrete-frame buildings in England have proved generally satisfactory in their resistance to bomb attacks from the air, according to a report of the British Institution of Structural Engineers, as noted in a recent issue of "The Engineer" (London). It is stated that structures of this class have stood attack in "the most remarkable manner," and have shown great powers of resistance and resilience.

"They have withstood attacks with the heaviest bombs, while buildings with brick walls and timber floors have collapsed utterly under the action of small bombs. Other things being equal, floors of solid concrete strengthened with filler joists or steel reinforcement stand up better and give more protection against bombing than floors in which lightness has been obtained by the use of hollow tiles, or in other ways. Evidence shows that massive and heavy construction in walls, floors and roofs increases the resistance to blast and the protection against splinters and falling débris."

As to the repair or reconstruction of buildings damaged by the bombing raids, the report states that an examination by an engineer should be one of the first steps, and would often prevent further damage due to attempting demolition without adequate knowledge of the forces to be dealt with.

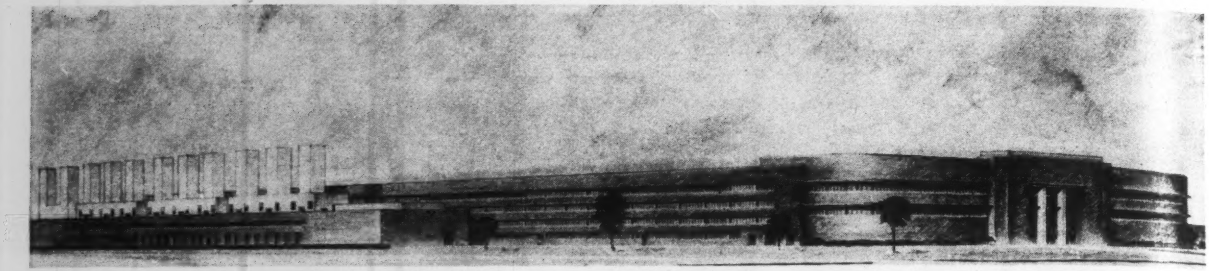


Fig. 1. Modernity and permanence characterize the new Ford airplane engine plant at River Rouge near Detroit.

FACTORIES FOR DEFENSE

Plane Engine Plant Sets New Precedents

Contents in Brief—*The Ford Motor Co.'s aircraft engine factory is the finest building at its huge River Rouge plant. Of steel frame construction it is 1,008 ft. long (currently being increased to 1,400 ft.) and 360 ft. wide. Foundations required 3,500 tons of spiral welded steel pipe. The two-story production area is surrounded by office and service areas. Elaborate air conditioning system cleans air electrostatically and maintains a 75-deg. temperature. Continuous beam and girder framing is used. Entire building was enclosed in the largest temporary shelter on record, to permit uninterrupted winter construction.*

WHEN THE FORD MOTOR CO. last August accepted a contract to manufacture Pratt & Whitney 18-cylinder, 2,000-hp. radial aircooled engines at the rate of 15 per day (now increased to 40 per day), it set the stage for a national defense construction project that has few superiors either in interest or significance. For the building that has just been completed on one of the few remaining vacant sites in the 1,200-acre River Rogue plant at Dearborn, Mich., shatters precedents in both design and construction. Justification for such superlative characterization appears in the following facts among others:

It is a building within a building, the factory being inside an inclosing shell that accommodates offices, service and utility rooms; the factory contains two stories, the service shell four stories in the 50-ft. height.

It is the first completely air conditioned building in a plant that pioneered in the use of air conditioning in portions of earlier buildings; embodying the most modern ideas, the air conditioning layout is also of unusual size, being capable of supplying 2,000,000 cu. ft. of air per minute.

It is a fitting addition to a plant whose development, building by building, over the past two decades has resulted in the world's best exhibit of progress in factory design; in architectural treatment, in materials and service equipment, it admits of no compromise with a policy which has required that each new building should be better than the last one.

It is on a site that required pile supports of 100-ft. average length for every one of the more than 500 footings; the 45 miles (3,500 tons) of spiral-welded steel tubing used represents the largest installation of this product ever made in a foundation.

It is served by a utility installation that incorporates every conceivable modern development, including subterranean pipe and electrical tunnels, compact grouping of main power controls in safe and attractive enclosures at the columns, fluorescent lighting and electrostatic air filters.

It makes use of numerous design specialties, including enameled steel window sills and louvred awnings, continuous beam framing and crane rail supports on the bottom flanges of girders.

It was designed and built in less than eight months; and during construction it was protected by the largest weatherproof shell ever used, some 250,000 sq.ft. of moistureproof fibreboard being required to inclose the 20,000,000-cu.ft. volume of the building.

In both design and construction, therefore, the new Ford airplane factory merits careful study. It represents industrial building development at its best.

SPACE ASSIGNMENTS IN FORD PLANE ENGINE FACTORY

(Not including training and engine test areas)

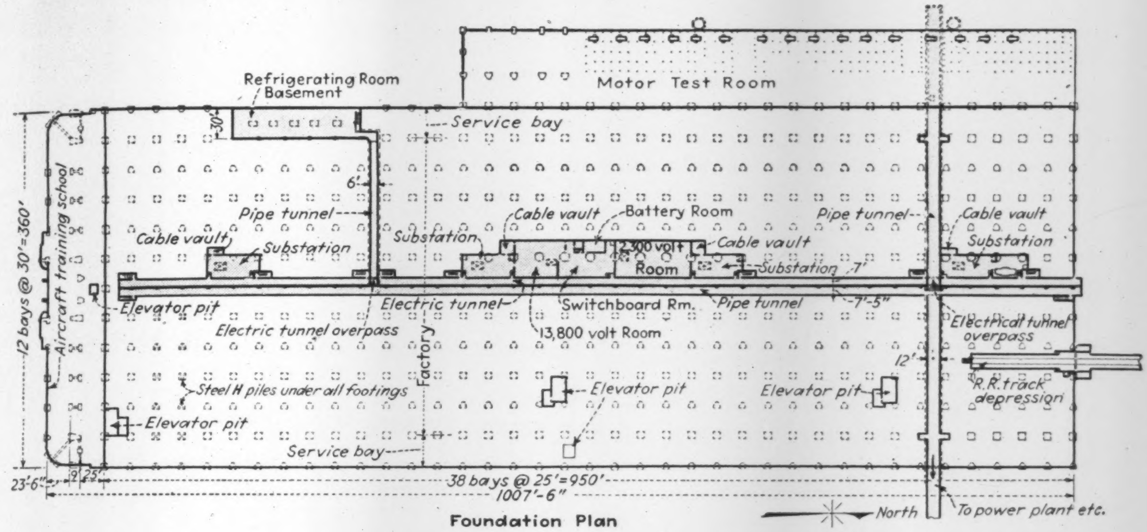
Use	Area	% of total
Production	570,000	68.9
Toilets & Showers..	18,890	2.3
Coat Rooms.......	22,286	2.9
Lunch Rooms......	35,010	4.3
First Aid..........	1,011	.1
Offices	17,118	2.1
Duct Spaces.......	19,663	2.7
Fan Rooms........	33,668	4.1
Refrigerator Rooms.	7,612	.9
Traffic Aisles, etc...	63,809	7.3
Substations	12,820	1.6
Pipe Tunnels.......	16,544	2.0
Electrical Tunnels..	6,608	.8
	825,039	

Note: This is for a building that is to accommodate 10,000 employees.

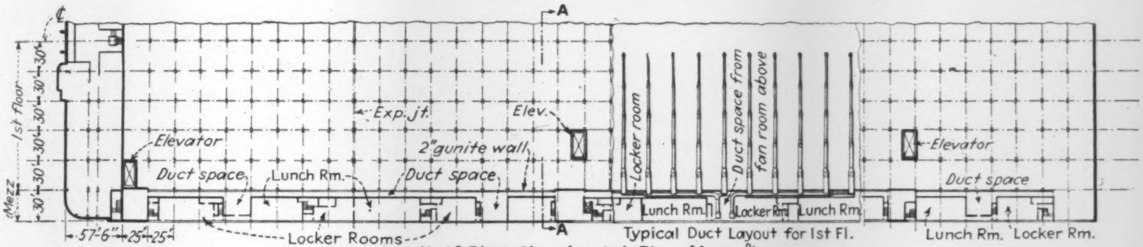
The general plan

The building (Fig. 2) is a rectangle, 1,008 ft. long by 360 ft. wide, with an adjoining wing 73x707 ft. in plan in which engine test facilities are located. (Although the length of the building is now being increased to 1,400 ft. this article is devoted to the 1,008 ft. length that comprises the original structure. A section 57.5 ft. wide across the south or front of the main building is devoted to air craft training; three stories high, it includes classrooms, offices and dining facilities for both full-time training of apprentices and part-time instruction of the plant's working personnel. The remainder of the main building, 360x950 ft., is the factory of which the outer 30-ft. bays on either side are devoted to office facilities, toilet, locker and toolrooms, air conditioning equipment and ducts, and pedestrian traffic aisles serving the production floors.

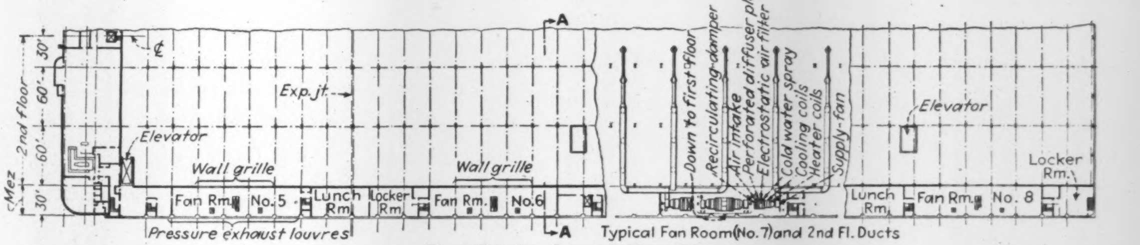
The production area, therefore, is


Motor Test Room
Refrigerating Room
Basement
Service bay
12 bays @ 30'=360'
Aircraft training school
Pipe tunnel
Cable vault
Substation
Cable vault
Battery Room
2300 volt Room
Cable vault
Substation
Pipe tunnel
Cable vault
Substation
Elevator pit
Electric tunnel
Switchboard Rm.
Pipe tunnel
7'
7'-5"
Electric tunnel overpass
13,800 volt Room
Factory
Electrical tunnel overpass
12'
R.R. track depression
Steel H piles under all footings
Elevator pit
Elevator pit
Elevator pit
Service bay
23'-6"
25'
38 bays @ 25'=950'
1007'-6"
North
To power plant etc.

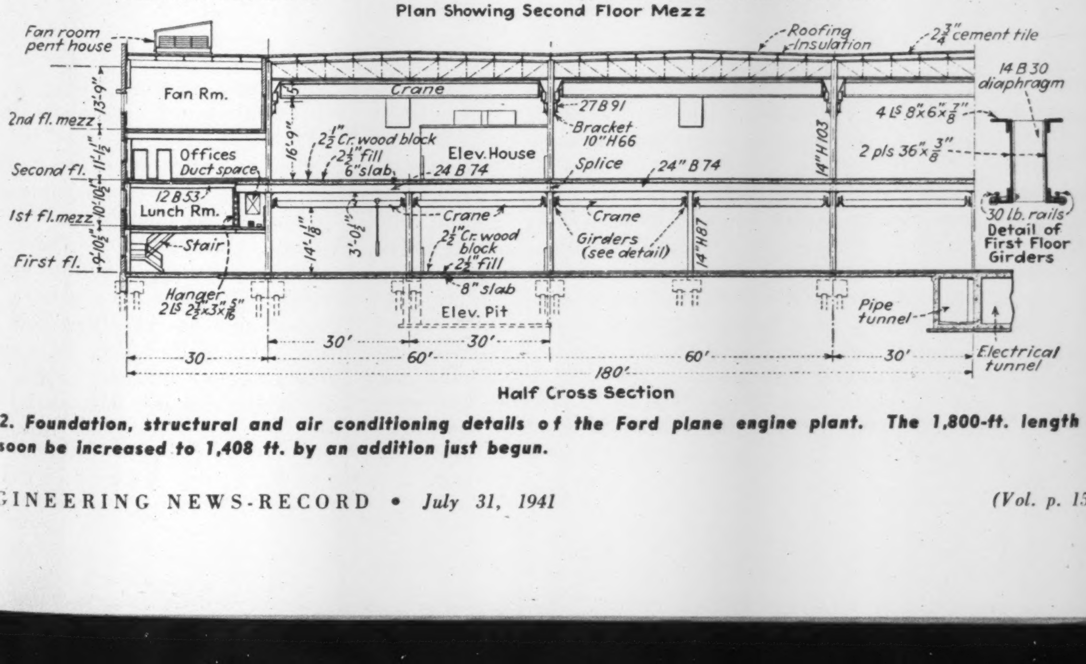
Foundation Plan


A
1st floor
Mezz
Exp. jt.
Elev.
Elevator
2" gunite wall
Duct space
Lunch Rm.
Duct space
Locker room
Duct space from fan room above
Elevator
Duct space
Lunch Rm.
Locker Rm.
Lunch Rm.
Locker Rooms
57'-6"
25
25
A
Typical Duct Layout for 1st Fl.
Lunch Rm.
Locker Rm.

Half Plan Showing 1st Floor Mezz


A
2nd floor
Mez
Exp. jt.
Elevator
Wall grille
Wall grille
Down to first floor
Recirculating damper
Air intake
Perforated diffuser plate
Electrostatic air filter
Cold water spray
Cooling coils
Heater coils
Supply fan
Elevator
Locker Rm.
Fan Rm. No. 5
Lunch Rm.
Locker Rm.
Fan Rm. No. 6
Lunch Rm.
Fan Rm. No. 8
Pressure exhaust louvres
A
Typical Fan Room (No. 7) and 2nd Fl. Ducts

Plan Showing Second Floor Mezz


Fan room pent house
Roofing
Insulation
2¾" cement tile
Fan Rm.
Crane
27B91
Bracket 10" H66
14B30 diaphragm
4 Ls 8"x6"x⅞"
2 pls 36"x⅜"
2nd fl. mezz
Second fl.
1st fl. mezz
First fl.
13'-9"
11'-1½"
10'-10½"
9'-10½"
16'-9"
Offices
Duct space
2½" Cr. wood block
2½" fill
6" slab
Elev. House
24 B 74
Splice
24" B 74
14" H 103
12 B 53
Lunch Rm.
Stair
14'-1⅛"
3'-0½"
Crane
2½" Cr. wood block
2½" fill
8" slab
Crane
Girders (see detail)
14" H 87
30 lb. rails
Detail of First Floor Girders
Hanger 2 Ls 2½"x3"x5/16"
Elev. Pit
Pipe tunnel
Electrical tunnel
30
30'
30'
60'
60'
30'
180'

Half Cross Section

Fig. 2. Foundation, structural and air conditioning details of the Ford plane engine plant. The 1,800-ft. length shown will soon be increased to 1,408 ft. by an addition just begun.

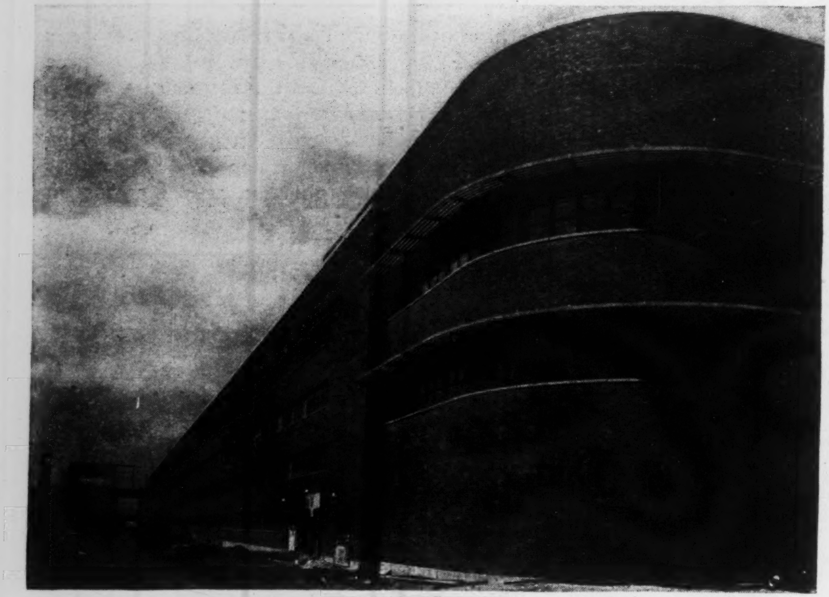


Fig. 3. Facade of training school section at front of building is featured by enameled metal louvre awnings. The same enameled metal is used for window sills throughout the factory. Engine test cells are being built in left background

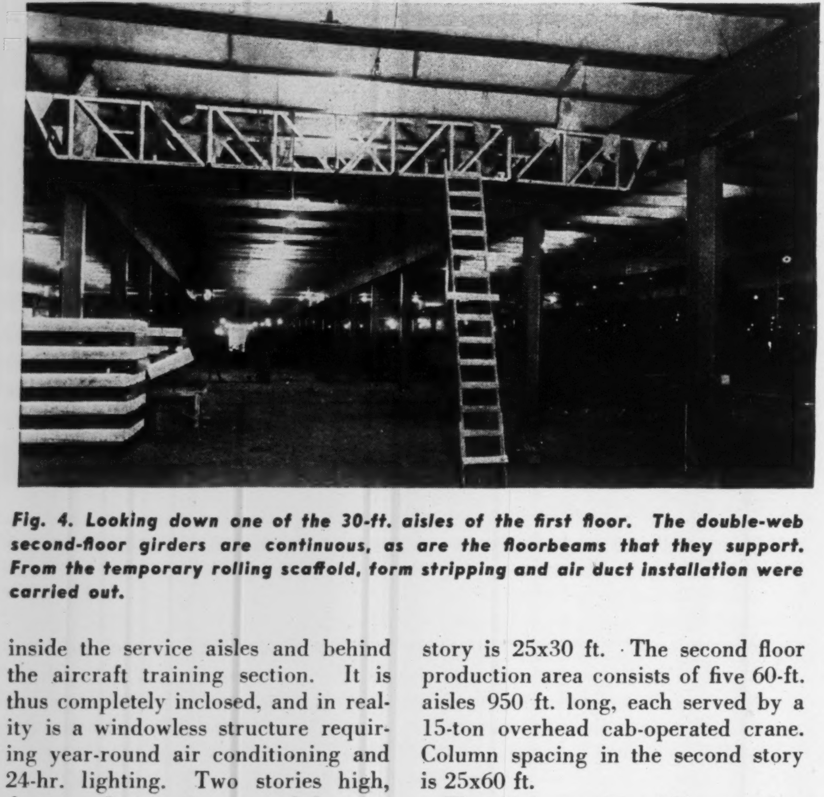


Fig. 4. Looking down one of the 30-ft. aisles of the first floor. The double-web second-floor girders are continuous, as are the floorbeams that they support. From the temporary rolling scaffold, form stripping and air duct installation were carried out.

inside the service aisles and behind the aircraft training section. It is thus completely inclosed, and in reality is a windowless structure requiring year-round air conditioning and 24-hr. lighting. Two stories high, the second story is reserved for machining operations while all of the other manufacturing and assembly work will be done on the first floor. The latter consists of ten 30-ft. aisles, 950 ft. long, each served by a 5-ton overhead crane operated from the floor. Column spacing in this first story is 25x30 ft. The second floor production area consists of five 60-ft. aisles 950 ft. long, each served by a 15-ton overhead cab-operated crane. Column spacing in the second story is 25x60 ft.

The 30-ft. service aisles at either side of the building include intermediate mezzanine floors for the major portion of the length of the building in both their first and second stories. The air conditioning fan rooms are on the second floor mezzanine, while the first floor mezzanine accommodates (among other facilities) the main distributing ducts that serve the first floor.

Underfloor construction

Although there is no basement as such, there are nearly 40,000 sq.ft. of underfloor rooms and tunnels shown shaded in the foundation plan of Fig. 2. Floors and walls of these facilities had to be reinforced to resist the hydrostatic pressure in the clay subsoil, and carefully designed drains were also installed. Basement floor slabs are generally 16 in. thick on a 4-in. concrete mud sill and have a 1 or 2-in. surface finish; in the electrical substation rooms slabs were increased to 24 in. to accommodate power ducts. The mud sills, extended beyond the walls of the tunnels and rooms, provide a shelf upon which 4-in. tile drains are laid. In general, walls of these underfloor facilities are 12 in. thick.

Structural framing

The general arrangement of the structural steel frame is indicated in Fig. 2. Principal items of interest in the framing relate to the second floor (designed for a 250-lb. per sq.ft. live load) where beams and girders are made continuous, Fig. 4. The girders, which run lengthwise of the ten 30-ft. production aisles, are 36 in. deep and of double-web, plate-and-angle type; the use of sections of 14-in. beams for diaphragms separates the web plates the right amount to permit them to straddle the columns to whose flanges they are riveted. One reason for the adoption of this particular type of girder was to provide a clear space for the passage of service piping from the first to the second story, but another advantage appears in its use as a crane rail support. These rails, for the 5-ton overhead cranes, are set on the 8-in. outstanding leg of the bottom flange angle, (Fig. 2) giving an unusually simple and inexpensive detail.

Transverse framing over the ten production aisles consists of 24-in. 74-lb. beams on 6-ft. centers resting on top of the double-web girders. In the six interior aisles the beams are in 60-ft. lengths, continuous over one support, while the girders in the outer two aisles at either side are made 6 ft. 7½ in. longer by a cantilever extension into the outside service aisles, and are thus continuous over two supports. This cantilever

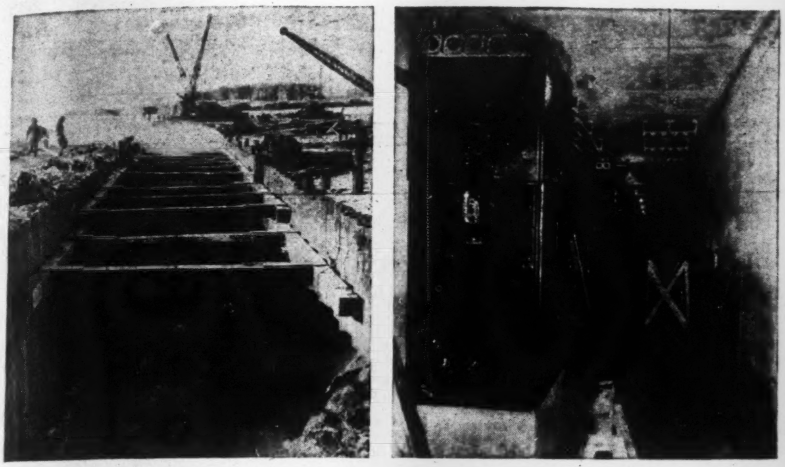
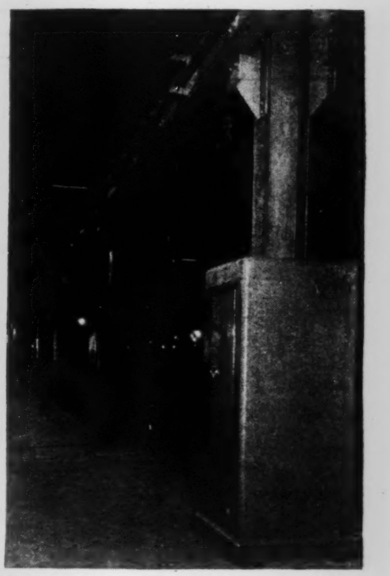


Fig. 5. The extensive basement facilities are typified by the electrical tunnel shown under construction and completed. Heavy earth pressures required full sheeting of all excavations.

Fig. 6. Enclosed power distribution panels at second floor columns. Production aisles on this floor are 60 ft. wide.



extension supports one end of a 12-in. beam that completes the service aisle span, and it also carries a hanger from which the first floor mezzanine is suspended. By this arrangement a considerable saving in steel was effected in the service aisle framing and, in addition, improved headroom was obtained in the office spaces.

Framing in the front section of the building is laid out to fit the special requirements of the training school. Thus the 57.5-ft. width is arranged in three spans of 23.5, 9, and 24 ft. The 9-ft. span accommodates a central corridor, opening into classrooms and other facilities on either side.

Floors and walls

Floors in the production area consist of a structural slab, 8 in. thick on the first floor and 6-in. on the second plus a 2½-in. fill of lean concrete over which a wearing surface of 2½-in. creosoted wood block is placed. The steel beams of the second floor are haunched in concrete placed integral with the slab, to impart increased rigidity to the construction and to decrease maintenance costs.

Exterior walls consist of 12 in. of brick alternating with four lines of steel sash, Fig. 3. Ordinary window glass is used in most of the sash, but at toilet and locker rooms obscure glass or insulated metal panels are substituted. These metal panels are also used at other locations where glass is not necessary, and it is pointed out that they could readily be substituted for all the glass in case it was ever desired to convert the building into a blackout factory. Metal louvres take the place of the sash at all fan rooms and at air exhaust locations on the first and second floors, and they also inclose the fan room penthouses on the roof.

An innovation is the use of gray colored enameled iron window sills in place of the usual stone. In addition to a relatively low cost, the sills, it is believed, will remain clean in the industrial atmosphere (or be periodically washed clean by rain), whereas stone is quickly discolored. This same material is used in louvred awnings (Fig. 3) installed over the windows of the aircraft training section.

Air conditioning facilities

Because of the dust-laden industrial atmosphere and the extreme precision required in aircraft engine manufacture, which places a premium not only on cleanliness but upon temperature and humidity control, the air conditioning installation in the plant had to be of exceptional size and efficiency. Fitting it into the building was a major item in the planning and design.

As previously stated, one of the controlling reasons for the service bay, which flanks the production area on either side, is to provide space for the air conditioning equipment and ducts. Exclusive of the aircraft training section, which has its own air conditioning layout, the building is divided into eight control areas, each served by a fan room located on the second floor mezzanine. Above each fan room is a roof penthouse serving as the air intake.

As indicated in Fig. 2, each fan room, of which there are eight, contains four complete air conditioning units, two for the first floor and two for the second. Except for the capacity of the supply fan, which may vary from 36,000 to 65,000 cfm., each unit is the same. Fresh air, pulled in through louvres in the roof penthouse, enters the air conditioning unit intake chamber, where it is joined by recirculated air from the factory. Passing through perforated diffuser plates which impart electric charges to any dust or smoke particles, the air comes in contact with a moving screen in an electrostatic air filter, which, being charged opposite to the particles, picks them up. The cleaned air next passes through a water spray for humidification, after which it contacts either heater or cooling coils, depending upon requirements.

Processing being completed, the air is picked up by the supply fan and forced out into the duct system. The arrangement of this duct system is indicated in Fig. 2. For the second floor of the factory, the ducts branch out directly from the fan room, but for the first floor the air ducts are carried down a duct space along the wall to the first floor mezzanine and from there branch out over the factory floor. Air leaves the ducts

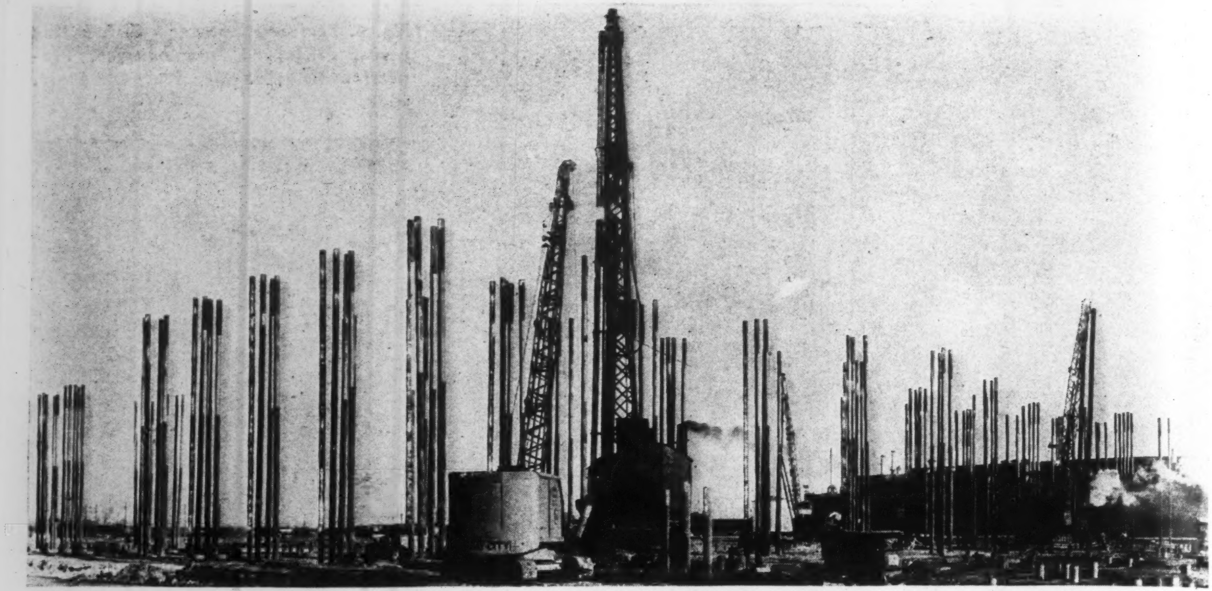


Fig. 7. Forty-five miles of spiral-welded pipe piles support the 500 building footings. In this view the piledrivers are starting work on the top 50-ft. lengths of the 100-ft. piles, after welders have joined them to the bottom lengths.

through ceiling diffusers spaced about 30 ft. apart. On the first floor there are 371 of these diffusers, each having a capacity of 1,500 cu.ft. of air per min.; each diffuser is 30 in. in dia. For the second floor there are 190 ceiling diffusers, each having a capacity of 3,750 cu.ft. of air per min., and each being 45 in. in dia.

Spent air, if it is not to be recirculated, is discharged directly to the outside through pressure louvres in the exterior walls of the first and second floors. If the air from the second floor is to be recirculated it is pulled back into the fan room through grilled wall openings. Spent air to be recirculated from the first floor flows to openings into the duct spaces on the first floor mezzanine and through them back to the fan room. Usually only a part of the air thus brought back is recirculated, and provision is made to discharge the remainder to the atmosphere through pressure louvres in the outside walls of the fan rooms.

Utility services

Even more extensive than the air conditioning layout is the system of pipes and conduits which supply electric current, (both d.c. and a.c. and at four different voltages), water, steam, compressed air and other services. The backbone of the utility system is represented by the underground tunnels and rooms. In general the utility system follows the pattern developed for the tool and die shop (*ENR*, April 11, 1940, p. 504), most recent predecessor of the airplane engine building at the Rouge plant.

Services have three points of origin: the refrigeration room, the electrical substation room and a transverse tunnel under the north end of the building, which brings steam and other utilities from other parts of the plant. Power facilities for the operation of the thousands of production machines are so hidden away underground in the vaults and tunnels that there is no indication on the factory floor that such things as motor-generators, transformers, circuit breakers and switch gear are a part of the equipment.

Power lines from the basement substations are led into the electrical tunnel down the center line of the building where all master panels, and low voltage circuit breakers are located. Branching off from this tunnel beneath the floor slab, the main power lines run to the building columns where power distribution panels, lighting panels, etc., are grouped in streamlined metal housings of uniform size and arrangement (Fig. 6). From these column panels, power distribution to individual machines is concealed in the $2\frac{1}{2}$-in. lean concrete fill beneath the wood block floor. Lighting is of the fluorescent tube type, the distribution conduits originating in the lighting panels at the columns from where they are carried to supports on the first and second floor ceilings.

Main service piping such as steam, compressed air, drinking water, city water, mill water, lubricating oil, cutting solutions, etc., are distributed along the length of the building in the piping tunnel adjacent to the electrical tunnel.

Construction features

Constructing a building such as this in eight months is largely a matter of coordination, involving material supply and disposition of working forces. At the same time methods of doing the work must be efficient and often ingenious. There were a number of such methods used on the Ford job that are worthy of note.

First as to the foundations. The 100-ft. lengths of $10\frac{3}{4}$-in.-dia., $\frac{1}{4}$-in. thick, spiral-welded pipe used for the piles were driven in two 50-ft. sections Fig. 7. One battery of pile hammers drove the first sections (equipped with driving points) in all of the footings. Behind these hammers came a crawler crane and a crew of tack-welders who set the second pile sections on top of the first. Another crew of welders followed to finish the weld splice that the first crew had only tacked. Finally a second battery of pile hammers completed the driving, after which the piles were cut off at grade and filled with concrete from transit-mix trucks. Column footing excavations were then completed, piles cut off at final levels and footings poured.

This construction scheme resulted in very fast foundation progress. Also, despite the fact that over 2,300 piles were driven into the hardpan to a resistance of 15 blows per in. with a 5,000-lb. hammer, only one split pile point resulted.

Building the underground tunnels and service rooms was a major undertaking because of the heavy pressure exerted by the blue clay and because of the necessity for winter protection (provided by steam-heated tent enclosures) when concreting was under way. To cope with the clay pressure all basement areas had to be enclosed in steel sheetpiling prior to excavation; and so great was the speed required that no re-use of any of the sheeting was possible.

Even before foundation work began, the entire site was interlaced with slag roads. Had it not been for this forehanded planning, construction operations would have bogged down in the mud many times. These roads proved particularly useful for steel erection. Procedure was to bring the railroad cars of steel onto the site where the members were unloaded onto skids by the locomotive cranes. These cranes then sorted the steel into proper piles from which it was trucked to the erection location and lifted into place by crawler cranes.

Steel erection involved 8,791 tons. Working with a crew of 128 men, four 20-ton crawler cranes and two 60-ton locomotive cranes, the contractor placed the 10,000 erection pieces required between Nov. 24 and Jan. 28, losing ten working days because of bad weather. The rate of progress is indicated by the fact that 1,500 tons of steel were erected in the last five days. Some of this progress is attributed to the use of continuous beams and girders which required only nine or ten field rivets per ton as against twice that many for the usual type of framing.

Winter enclosure

It was decided early in the planning of the job that expensive winter protection would be necessary and desirable if the production schedule was to be met. The plan as finally developed involved complete inclosure of the building (Fig. 8) from end to end and from ground to roof. As soon as several bays of steel were erected, construction of this weatherproof enclosure began. It consisted of self-supporting scaffolding about 10 ft. wide made up of 4x4-in timber posts with ten levels of cross-struts and the necessary diagonal bracing, all enclosed in moistureproof fiberboard. At the top this enclosure was extended over to the roof of the building, which had previously been completed.

Within this inclosure the workmen built the walls and concreted the floors, completely isolated from the weather. Material hoists placed outside the enclosure lifted brick, mortar and steel sash to openings at the various levels where work was going on. Salamanders placed on the scaffolding provided localized heat.

Inasmuch as steam is furnished to the building from the River Rouge plant power station, permanent mains were installed at the earliest possible moment and temporary unit heaters hung so that the floor concreting could be carried on safely.

The inclosure required 250,000 sq.-ft. of moistureproof fiberboard in 4x8-ft. panels, to cover the 900,000 sq.ft. of surface. Use of the inclosure was easily justified on the assumption that, without it, at least one-third of the working time would have been lost. Theoretically, it permitted 24-hr. operation for the 1,300-man construction force, but only a few trades worked three shifts.

Another construction expedient that saved time was the use of light, temporary rolling scaffolds riding on the crane rails of the first floor. From these scaffolds all of the second-floor slab and beam forms were stripped, all of the air ducts were placed, and the ceiling painted.

As with all Ford buildings, the airplane engine factory was developed and built under the supervision of the company's power and construction department, of which H. B. Hanson is the head. The building and all of the service equipment and facilities were designed by Giffels & Vallet, Inc., and L. Rossetti, associated engineers and architects of Detroit. B. Giffels was project manager and George Morgan resident engineer for the designers. Bryant & Detwiler held the substructure contract and the steel frame was fabricated and erected by the American Bridge Co. Esslinger-Misch Co., was the general contractor. The total cost of the job, including equipment, is listed at $21,000,000. With the 400-ft. addition now being built this cost rises to the neighborhood of $30,000,000.

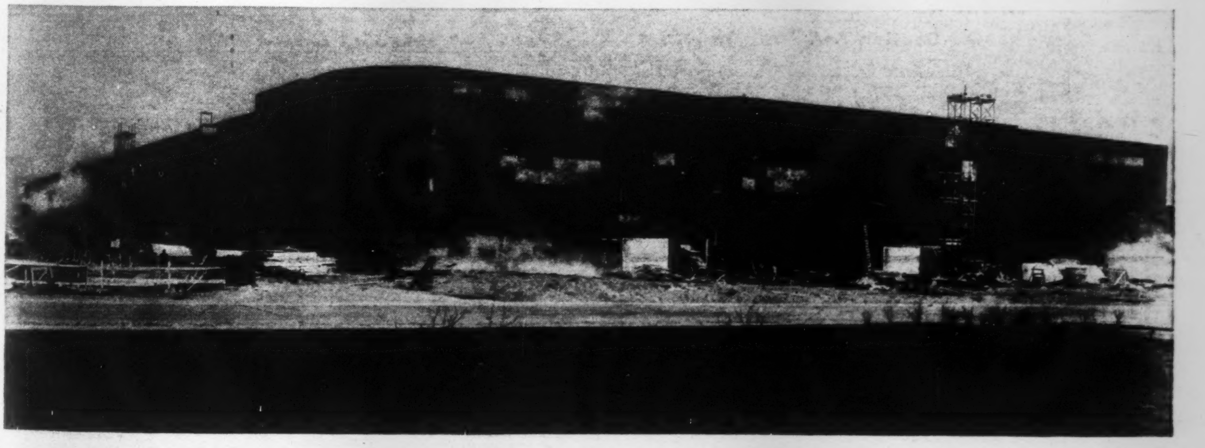


Fig. 8. Within a moistureproof fiberboard sheathing of record-breaking dimensions that enclosed the entire building, walls were built and floor slabs poured regardless of rain, snow or freezing temperatures.

Old Viaduct Reinforced by Welding

G. G. Landis
Chief Engineer, Lincoln Electric Co.
Cleveland, Ohio

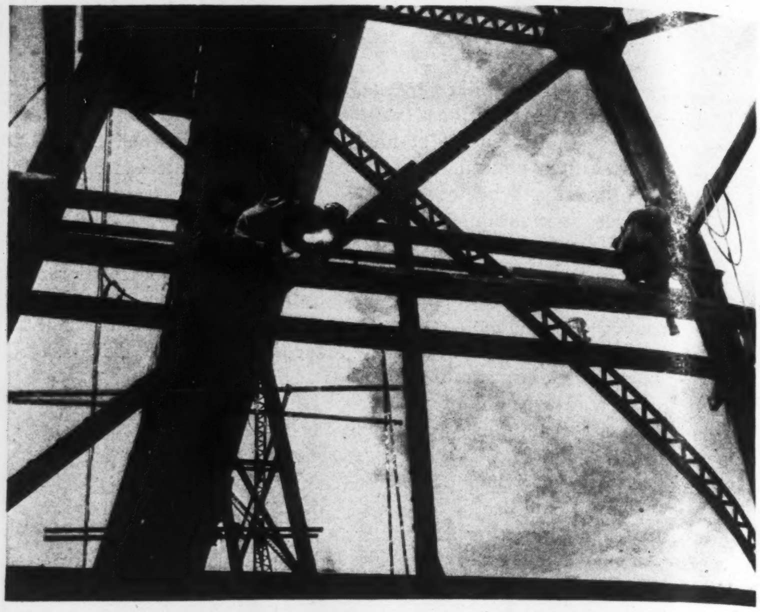


Fig. 1. Two welders at work on new transverse bracing that cut down unsupported lengths of tower columns.

IN STRENGTHENING A VIADUCT of the New York, Chicago & St. Louis R.R. from a load capacity of Cooper's E-40 to E-70 (18,000-lb. design stress), all the spans were replaced with new riveted girders and the substructure was reinforced with additional material applied by arc-welding. This viaduct, at Conneaut, Ohio, built in 1901, is 1,320 ft. long and consists of 60-ft. deck girder spans alternating with 30-ft. tower spans, together with one 120-ft. span, which originally was of truss type, but was replaced by a girder. Columns and towers were strengthened in two ways: (1) by auxiliary bracing around the towers to shorten the unsupported length of columns; (2) by increasing the column section.

The original column section consisted of four Z-bars, 6 x 3/8 in. and one web plate 8 x 3/8 in., giving a gross sectional area of 21.36 sq.in. Four angles welded on the two faces of the column were 3½ x 3 x 13/16 in., with a sectional area of 18.48 sq.in., thus increasing the total column section to 39.84 sq.in. In this reinforcement, shown in Fig. 4, the angles themselves are welded together along their adjacent edges, so as to form a channel section. In Fig. 3 the welder is near the top of one of the 50-ft.-high columns and making a butt weld. After running a bead 6 in. long, he made a pass on one of the fillet welds at the heel of either angle, allowing time for the first pass to cool. Then he went to the fillet weld on the other angle.

The towers were strengthened by new lateral and longitudinal bracing at two points halfway up between the old diagonals. Typical longitudinal bracing is shown in Fig. 2, and in

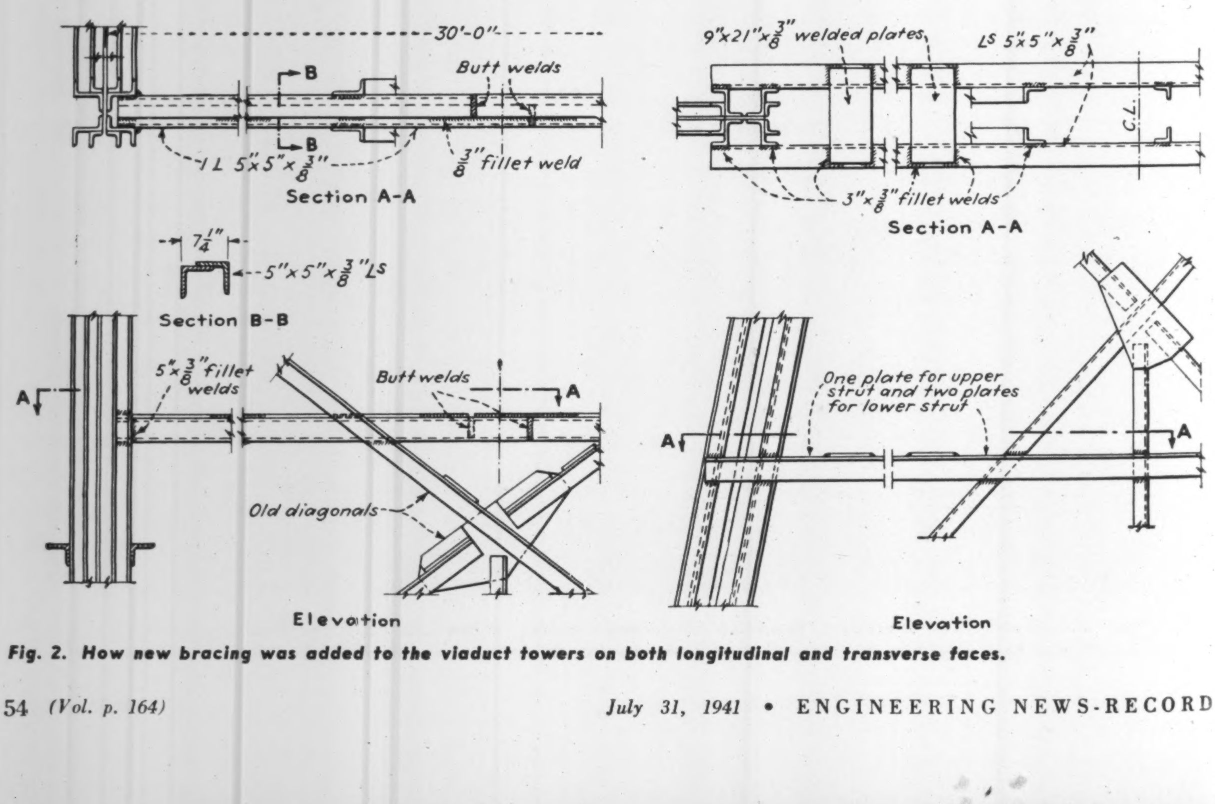

30'-0"
B
Butt welds
B
1 L 5"x5"x3/8"
3/8" fillet weld
Section A-A
9"x21"x3/8" welded plates
Ls 5"x5"x3/8"
C.L.
3"x3/8" fillet welds
Section A-A
7 1/4"
5"x5"x3/8" Ls
Section B-B
A
5"x3/8" fillet welds
Butt welds
A
Old diagonals
Elevation
One plate for upper strut and two plates for lower strut
A
A
Elevation

Fig. 2. How new bracing was added to the viaduct towers on both longitudinal and transverse faces.

Fig. 3. Looking down on welder at work on column.

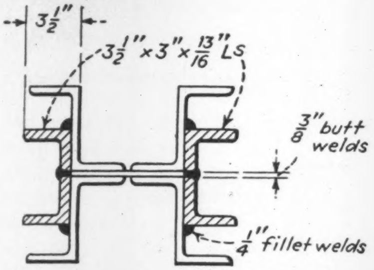

$3\frac{1}{2}''$
$3\frac{1}{2}'' \times 3'' \times \frac{13}{16}''$ LS
$\frac{3}{8}''$ butt welds
$\frac{1}{4}''$ fillet welds

Fig. 4. Columns strengthened by welding column angles on both sides.

Fig. 5. Welding new brace angle to flange of column.

Fig. 5 the operator is welding one of the two bracing angles to the flange of a column. This joint is welded along the vertical edge by a fillet weld 5 x $\frac{3}{8}$ in., and along the bottom inside edge by a similar weld 3 x $\frac{3}{8}$ in. Details of the transverse bracing, Fig. 2, consist of pairs of angles 5 x 5 x $\frac{3}{8}$ in. welded to the columns and to the old diagonal bracing by fillet welds 3 x $\frac{3}{8}$ in. The two angles are joined by four plates 9 x 21 x $\frac{3}{8}$ in. In Fig. 1, the welder at the left is making a fillet weld to one of the diagonals, while the welder at the right is making a butt weld on the column.

Eight welding operators were employed and the work consumed 14,000 lb. of electrodes. Power was furnished by seven welding machines. The contract time was 75 days. Welding was applied also around 1,400 erection-bolt heads in bearing plates which carry the spans. Each bolt head required 3 in. of fillet weld. The total welding bead footage was approximately five miles, and 98 percent of this was made in vertical or overhead position. This welding work was performed by Teleweld, Inc., Chicago, Ill., under the direction of its superintendent, T. L. Borman. The chief engineer of the railroad is A. C. Harvey, and F. S. Hales is bridge engineer.

Views Vary on USHA Water Rates

In Speaking before the American Water Works Association at that organization's recent annual meeting in Toronto, Ont., Hal F. Smith, senior administrative assistant, Detroit (Mich.) department of water supply, described the problem waterworks officials face in granting special rates to U. S. Housing Authority projects and made known the different views held by public and private administrators. From Nathan Straus, USHA administrator, Mr. Smith learned that the average water consumption per dwelling unit with USHA projects now in operation is 175 gpd., and that Administrator Straus expects special rates and concessions from public utilities for developments sponsored by the USHA.

When queried as to what more the water industry can do to cooperate with the USHA, Mr. Straus replied, "Of particular concern to USHA are those municipal water utilities which, contrary to general practice, refuse to extend to slum clearance projects water rates that have been made available to hospitals, schools, or other municipal or charitable institutions."

In order to secure some data of value to the A.W.W.A. and/or its individual members in formulating a policy of the issue at question, Mr. Smith had copies of Mr. Straus' statement sent to the American Gas Association, the Edison Electric Institute, and the Municipal Finance Officers Association.

The manager of the former association reported: "One of the important problems which the gas companies had to face from the start of the housing program was the request of the U. S. Housing Authority for gas services at prices enabling them to keep the overall cost of rent plus utility charges within the income levels of the families for whom the projects were being planned. In most cases, the available gas company rates were adequate to meet the situation. In some instances, the objectives desired by the U. S. Housing Authority were achieved by the purchase of all gas through a single master meter, thus enabling the project to purchase gas at the wholesale prices."

A representative of the Edison Electric Institute replied: "In summing up, I would express the opinion that utilities had cooperated with the USHA on all reasonable requests, and some had tried to see eye to eye with the housing authorities to the point of stretching both the reasonable and the economic factors. As a general rule, if one wants the business of USHA, concessions must be made somewhere along the line."

Carl H. Chatters, executive director of the Municipal Finance Officers Association, offered the following comment: "There is, in my opinion, no justification whatsoever for charging government housing projects any different rate than you would any other type of institution for similar quantities of water. The question of subsidies and exemptions is one of the most aggravating problems we have in government today, and the sooner we wipe out all special privileges and exemptions of any type whatsoever, the better off government will be."

Legal counsel obtained from a lawyer employed by city of Detroit was: "In conclusion, I wish to re-affirm my opinion that the granting of such special concessions in the way of reduced utility rate schedules and conditions of service to a public housing project has the weight of overwhelming legal precedent."

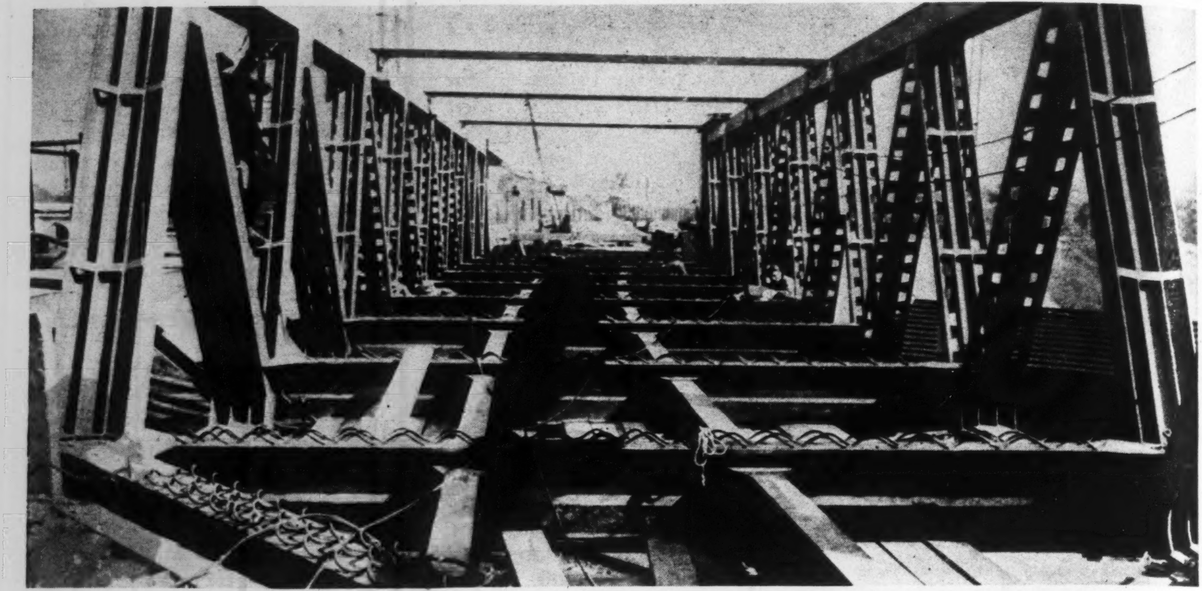


Fig. 1. First all-welded railway truss bridge in Europe, Joncherolles bridge, near Paris, utilizes special member makeup.

Welded Bridge Practice in Europe

LaMotte Grover
Structural Welding Engineer
Air Reduction Sales Co., New York, N. Y.

***Contents in Brief**—French, Belgian and English practices on welded bridges differ from ours, partly because of use of different materials. Special expedients are used to eliminate shrinkage stresses, and special forms of members are often resorted to. Butt welds are used wherever possible because of their greater efficiency, especially under fatigue stresses. Other details include ribbed flange plates for girders, tees for web stiffeners and reinforced H-sections for truss members.*

EUROPEAN EXPERIENCE and technical developments in welded bridge construction have been reflected extensively in American practice in regard to economy as well as to fundamental technical features despite a substantial difference in comparative costs of material and labor. For this reason, American designers and fabricators should be interested in certain trends of practice that were reflected by all-welded bridges built in Europe just prior to the war.

French railway truss bridge

In the Joncherolles bridge, near Paris (Fig. 1), European welding practice was extended to include railway truss spans. It is a Warren-type single-track bridge of 131-ft. span, extremely skewed and on a curve of 985-ft. radius. It is also the first truss bridge for which the forms of the members, as well as the details of the joints, have been adapted especially for welded construction methods and efficient design. In Germany, only highway bridges are of the truss type, but there are more than 300 all-welded railway girder bridges.

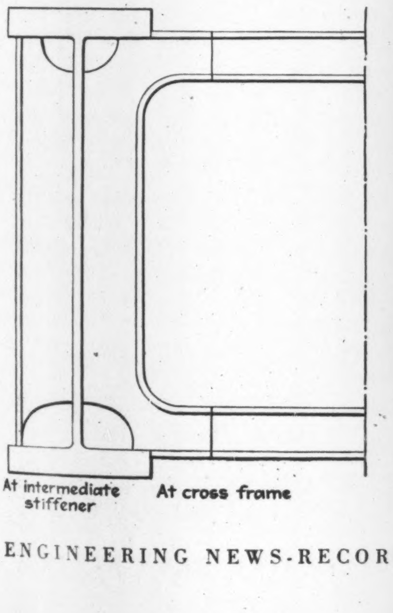
Main objectives in the design of the Joncherolles bridge were as follows: (1) to reduce shrinkage stresses in the members, due to excessive concentration of welding; (2) to reduce secondary truss-deflection stresses by using compact joints, and at the same time to take advantage of the higher efficiency of butt-weld as compared wtih fillet-weld connections to gusset plates; (3) to avoid such thickness of material as to require special welding procedures and to avoid extra expense involved in the use of high-strength alloy steel; (4) to make all welds accessible, even after completion of the construction; (5) to enable each main truss to be welded completely in the shop.

The four-plane system of top chord and web members (Fig. 2) provides less stiffness for a given cross-sectional area than a two-plane system of plain rolled sections, especially in a lateral direction, but it affords enough stiffness for well balanced design of compression members. The ingenious method of building up the top chords from H-beams with intermediate ribs, and fabricating the web members from narrower H-beams flanked by tees (made from beams split along a serrated line), permitted easy adjustment in depth of section to compensate for mill tolerances, as well as a convenient means of varying the cross-sectional area. Flat bar tension chords, flexible in the plane of the truss, further reduce secondary stresses. The bottom chord section is increased, as required from panel to panel, by two flat bars of various sizes, one above and one below the main bar. Easy transitions for transfer of stresses, especially desirable in welded joints, are provided by small curved-edge gussets in the planes of all four flanges or ribs at the truss joints.

Spiral reinforcing bars are welded to both upper and lower sides of the top flanges of the floorbeams (see Fig. 1) to bond with the concrete floor and thus reduce deflections and consequent end rotations of floorbeams. These deflections are reduced further by coverplates on the bottom flanges. By means of vertical diaphragms at the floorbeam connections, the web of the floorbeam is prolonged to distribute the reaction to all four ribs or planes of the web members. The bottom flange of the floorbeam is butt-welded to the flat bottom chord, and the top flange is connected to the web members by triangular horizontal gussets.

The stringers are I-beams with continuity developed where their ends meet on opposite sides of the floorbeam webs. Trapezoidal gussets for both top and bottom flange connections of the stringers spread the transfer of stress to avoid "notch effects" and stress concentrations. Each 131-ft. truss, weighing 35 tons, was assembled and tack-welded and then placed in a revolving fixture for down-hand symmetrical deposition of welds in proper sequence, to avoid distortion and high shrinkage stresses. American steel fabricators might consider this design as impractical under our methods, but European engineers can economically adopt more refinements than we can, to effect the most efficient use of materials at the expense of increased labor cost. However, as the effects of fatigue and of forms of joints and members upon stress concentrations become more recognized, and are reflected in allowable unit stresses, we can expect some radical changes in our conceptions of efficient design for welded construction.

Fig. 3. *T-stiffeners used on welded plate girder bridge at Ougree, Belgium.*



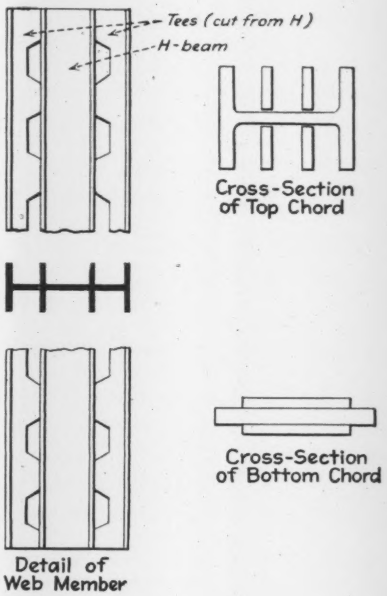


Fig. 2. *Unique design characterizes truss members of Joncherolles bridge.*

Belgian plate-girder highway bridge

The plate girder highway bridge across the Meuse at Ougrée, Belgium, a three-span deck type cantilever structure, 545 ft. long, presents special design and construction features in the use of high-strength alloy steel. The specifications reflect Belgian experience with the welding of basic Bessemer steel for Vierendeel truss bridges, by requiring open-hearth steel for the six lines of main girders. These girders are braced transversely with rigid open crossframes of Bessemer steel under the 40-ft. roadway. Cyclist paths and sidewalks are supported on cantilever brackets.

Intermediate T-shape web stiffeners with flanges outstanding have their stems coped at both ends (Fig. 3) and are welded to the flanges with longitudinal fillets since transverse welds lower the fatigue strength of tension flanges. The exterior girders have horizontal web stiffeners at the height of the bottom flanges of the cantilever brackets to distribute the thrust. The webs vary from 6.6 to 9.8 ft. in depth.

The special ribbed flange plates (Fig. 3), adopted from German and Swedish practice, are 23½ in. wide and 1 to 3 in. thick. Butt welds for tension flange splices are skewed 45 deg., as in German practice. As the end girders were fabricated in three

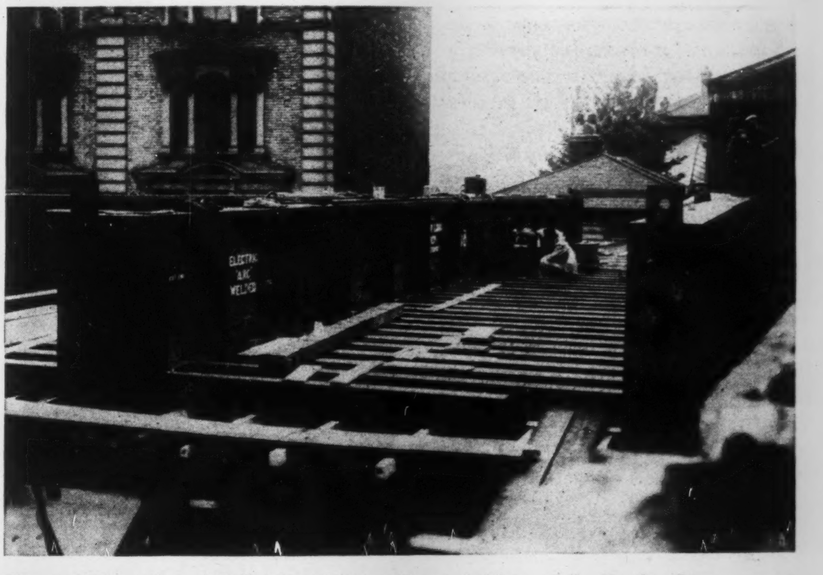


Fig. 4. *Interesting detail of welded railway bridge at Ladbroke Grove, near London, is use of triangular gussets at ends of stiffeners to permit connection to flanges without transverse welds.*

sections each, and those of the suspended span in two sections, there were a good many field splices. These were all butt-welded, to avoid the stress concentrations that occur at ends of splice straps and reduce resistance to repeated stress and impact. Shop splices in the flanges and webs of the girder sections were all made before the flanges were welded to the webs. Special positioning devices enabled all shop welding to be done in advantageous positions.

The sequence of welding was carefully planned throughout shop and field operations to provide as much freedom as possible for contraction of areas heated during welding, thus eliminating distortion and excessive shrinkage stresses. Skip and "step-back" or "wandering" sequences were used to distribute the heat of welding and thereby reduce differential shrinkage. Welded temporary clips and other devices maintained alignment at field splices prior to welding. There were no erection bolt holes in main materials.

Vertical field splices of the girder webs are double-V butt welds, but the field flange splices are of single-V type to eliminate overhead welding, except the sealing welds on the underside. Because of thicknesses as great as 3 in., some of the flange joints were preheated to 212-250 deg. F., to avoid rapid cooling, which is particularly undesirable in some types of alloy steel. Each butt weld was completed and back welded on the opposite side without any interruption that would permit the area to cool appreciably and result in uneven distribution of heat. An X-ray inspection proved all welds to be sound.

English plate girder railway bridges

In the half-through plate-girder railway bridge of the London Passenger Transport Board at Hainault, near London, certain fundamental features of design contrast with continental practice. The English engineers have continued the use of plain, flat flange plates, even in very thick material, simply fillet-welded to relatively thin web plates. This detail proved to be satisfactory for flanges 2 in. thick in the all-welded Billingham Beck highway bridge (*ENR*, May 14, 1936, p. 707, and May 17, 1934, p. 626), carrying such exceptionally heavy loads as trucks with two 75-ton axle loads. The same general type of main girder was used with good results in the first all-welded railway bridge in England, constructed two years ago by the same board, over Ladbroke Grove Road (Fig. 4) at Kensington (London).

One thing that may account for differences from continental practice is that the English have used a standard open-hearth carbon structural steel, nearly like the A.S.T.M. A-7 steel, instead of experimenting with high-strength alloy steels of questionable welding characteristics, or with the less expensive Bessemer and commercial grades of steel, as formerly used in Belgium.

Although butt-welded joints are superior to fillet welds in efficiency to resist repeated stress and shock, and are to be preferred for many types of details, there are other details for which fillet welds are adequate, and perhaps preferable, because of the kind of stress, its direction and intensity. In view of German difficulties with butt-welded web-to-flange connections, and the absence of difficulties with fillet welds in England and the United States, it appears that German engineers may have needlessly complicated the control of shrinkage stresses, as well as increased the cost of their welded girders, by using butt welds for joining webs to flanges.

The Ladbroke Grove bridge, a through-girder structure, consists of three main girders supporting closely spaced floorbeams encased in a concrete slab. The 67-ft. girders contain double-V butt-weld shop splices in the main flange plates near the quarter-span points, as well as butt-welded splices between their three web sections. The main flange plates of the center girder, 20x2$\frac{1}{2}$ in., are covered with long taper-ended reinforcing plates, 18x2 in., 44 ft. long, to provide extra section near midspan. The end web sections are $\frac{7}{8}$ in. and the center section $\frac{5}{8}$ in. thick.

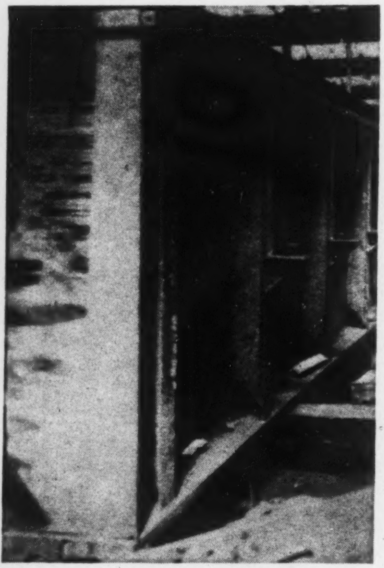


Fig. 5. On main girder of Hainault Bridge, near London, brackets on stiffeners carry floorbeams. Ends of stiffeners are coped to reduce transverse welding.

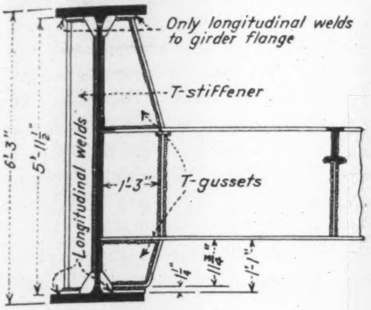
The flanges of the outside girders are not coverplated. A mid-section, 18x1$\frac{7}{8}$ in. by 40 ft. long, is spliced by double-V butt welds to 18x1$\frac{1}{4}$ in. sections at each end. The $\frac{1}{2}$-in. webs are in three sections for each girder, spliced with double-V butt welds. Web stiffeners for all girders are flat bars coped at their ends and supplemented with small triangular gussets (Fig. 4) to provide for attachment to the flanges without the use of transverse welds.

The Hainault bridge required more complicated framing because of special track layout and a 60-deg. skew. Two main girders receive most of their load from a heavy cross-girder carrying the major part of the track load from four lines of longitudinal stringers, which receive their load from closely spaced floorbeams encased in the concrete deck slab. This system of framing was adopted to equalize the deflections of the main girders, which are not parallel and are of different lengths (51 ft. and 54 ft.) for the 40-ft. span.

For these short girders (Fig. 5) it was more economical to carry the maximum flange section throughout, rather than to use flange splices or coverplates. Their flanges are two 18x2$\frac{1}{2}$-in. plates joined to a 67x$\frac{1}{2}$-in. web plate with $\frac{3}{8}$-in. continuous fillet welds, the longitudinal shear being almost uniform. The stiffeners are 8-in. I-beams with their inner flanges welded to the web and their ends coped to minimize transverse welding across flanges, especially where they carry tensile stress. These copes also prevent the accumulation of dirt and moisture at the lower ends of the stiffeners.

The cross-girder is composed of 38$\frac{1}{2}$x$\frac{3}{4}$-in. web and 22x2$\frac{1}{2}$-in. flange plates, with web stiffeners of 10-in. I-beams, having their ends coped as in the main girders. This girder is of interest in that its end connections are haunched to bring

Fig. 6. Floorbeams of South Station viaduct in Brussels are connected to girders by T-section gussets.



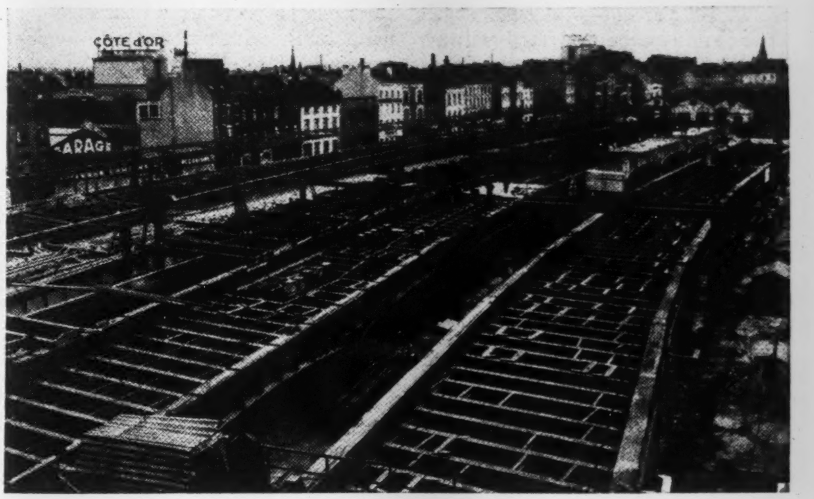


Fig. 7. Welded elevated railway structures of South Station, Brussels, Belgium. Rigid-frame spans alternate with centilever spans. All span lengths are 59 ft.

the top flange up to the top of the main girder and thus provide for any negative moment that might be developed, despite the torsional flexibility of the main girders. Although the girder is proportioned for simple end support, the haunch is curved to provide an easy transition and smooth lines of stress flow. The bottom flange of the girder is welded directly to the bottom flange of the main girder with a single-J butt weld, back welded in a shallow bevel groove on the under side. This minimizes overhead welding and eliminates scarfing of the edge of the main girder flange, a feature that had led to trouble in a Belgian bridge. Triangular gussets welded to the $\frac{7}{8}$-in. haunch webs, and bearing on the bottom flanges of the main girder, provided temporary support during erection. The longitudinal stringers are similar in makeup to the girders. Stiffeners are 7-in. channels, coped at their ends, and the stringers have 45-deg. haunched ends to meet the depth of the cross-girder.

French rigid-frame railway bridge

A welded rigid-frame bridge, composed of two independent three-span structures side by side on a skew of 41 deg. over the Boulevard Ney in Paris, was built by the North Railway in 1936, and was the second all-welded railway bridge in France. Bids were invited on the basis of using welding alone or combined with riveting, and using either high-strength steel or ordinary carbon steel. The low bid was for all-welded construction in ordinary steel. Deep girders could be used for the center span of 115½ ft., but vertical clearances over roadways required shallow girders in the two 73-ft. end spans.

Each structure consists of two lines of rigid-frame girder-bents spaced 13.3 ft. c. to c., with floorbeams framed between them, except that the legs of the bents are joined together and braced by skewed portal frames. Two lines of I-beam stringers are framed between the webs of the intermediate floorbeams, with the top flanges of the stringers against the under side of the floorbeam flanges. Triangular horizontal gussets of tapered thickness provide a gradual transfer of stringer flange stresses across the floorbeams. Vertical trapezoidal gussets under the stringer ends rest on the bottom flanges of the floorbeams.

The stringers are aligned to fit a curve in the tracks, but the main girders are straight. The floor system is covered with $\frac{5}{16}$-in. deck plates. A sidewalk 2.4 ft. wide is cantilevered out on the side. The entire structure contains 600 tons of steel.

The main girder-bents are built from two special rib-type flanges $15\frac{3}{4}$x$2\frac{1}{16}$ in., butt-welded to a web 0.79-in. thick. The girders are 4.82 ft. deep at the middle of the center span and 3.47 ft. in the end spans. Flange reinforcing plates $1\frac{9}{16}$ in. thick and tapered at their ends provide additional section at the legs. The web stiffeners of the main girders are blocked out at intervals (as in the Meuse River bridge) to reduce the amount of welding on the webs and thereby lessen the tendency toward distortion or shrinkage stresses.

Intermediate floorbeams are composed of two rib-type flanges $11\frac{3}{4}$x $1\frac{3}{16}$ in. and a 0.59-in. web. Their bottom flanges are straight, but the top flanges are haunched up and the depth of web increased to meet the tops of the main girders. Between the main floorbeams are supplementary I-beams to support the deck plate; they frame into the stringers and are extended and joined to the main girders as in the Hainault bridge. Each main girder-bent, continuous over the three spans, was shipped in seven girder sections and two haunched leg sections, after shop assembly and match marking.

All splices in the flanges and webs of the girders are butt-welded, and the floorbeam webs also contain butt-weld splices. The flange splices of the girders illustrate a frequent occurrence in welded design whereby practices intended to be conservative turn out to be otherwise. These splices are of an X-pattern in plan, the flanges on either side of the splice being tapered in width to a point. The triangular spaces left on the sides are filled with inserts of thicker base metal, so that a section cut at any point will include both weld metal and base metal. Theoretically this will develop the required total flange stress, despite the comparatively low stresses for weld metal prescribed by old regulations. Many tests, both static and fatigue, have shown that joints of this kind are actually no better than ordinary butt welds normal to the axis of the plate, even though such a specially shaped joint is perfectly executed. Furthermore, its form results in difficulties in controlling defects at the point of intersection of the grooves, as well as difficulty in controlling shrinkage stresses. Fatigue tests have also shown that a butt weld is the only kind of a splice that will develop 100-percent joint efficiency.

The rigid-frame elevated-railway viaduct at the South Station in Brussels (Fig. 7) was the first all-welded railway bridge of importance in Belgium. It consists of one single-track and two double-track structures, parallel to each other, with framing between them to support platforms and shelters. Each structure has ten 59-ft. spans. Alternate spans contain two rigid-frame girder-bents spaced 24.6 ft. laterally, with portal frame bracing between the legs (as in the Boulevard Ney structure), and with intermediate transverse floorbeams 4.92 ft. c. to c. Longitudinal floor joists are framed between the transverse members to form a grid supporting a steel plate floor. On either end of these alternate rigid-frame spans there are 12.55-ft. cantilever extensions to support suspended decks in the intervening spans, which have similar floor construction. The structures are straight for half their 590-ft. length, and have then a polygonal alignment to follow a curve in the tracks.

The main girders of the double-track structures are composed of a web of variable depth, butt-welded to two rib type flanges $23\frac{5}{8}$x$1\frac{3}{4}$ in., the bottom flanges being curved in advance to follow the profile of the girder. Each web and flange contains a number of shop splices. Flange reinforcing plates, $11\frac{13}{16}$x$1\frac{3}{8}$ in., are welded in place, with side fillets at points of maximum moment. Stress concentrations are avoided by tapering the ends of these plates to 4x0.4 in. in a distance of 20 in. Near the legs there are full I-section web stiffeners. Intermediate stiffeners are of split beams with flanges outstanding. In regions of compressive stress, triangular gussets stiffen the flanges and adjacent web at points between the full-height stiffeners. Extra bar-stiffeners are used in the legs and at the hinge-rocker supports for the suspended spans.

Each floorbeam contains two field splices 5 ft. 5 in. from the main girders. The end sections are shop welded to the girder webs and are haunched by means of vertical T-section gussets, which also stiffen the girder web above and below the ends of the floorbeams, (Fig. 6). Insert-pads at the ends of these gussets and at the ends of the stiffeners eliminate fillet welding across the flanges.

Each structure was completely erected before the field welding was started. The parts were held together temporarily with pairs of clip angles tack-welded on either side of the field joints and provided with holes in their outstanding legs for erection bolts. Some of the main girder sections were 86.4 ft. long and weighed 46 tons. Radiographs of welds proved the effectiveness of careful organization and supervision on the part of the fabricators, as well as of adequate engineering control and inspection on this structure.

Conclusion

These examples of welded bridge construction in Europe indicate the manner in which the engineers have faced their welding problems. They have overcome difficulties arising from the use of special steels and from insufficient understanding of proper design and construction methods. Through persistent efforts in research and through extensive experience they have contributed much to bring welding to its present status, where specifications can be written which, if properly enforced, will insure reliable welded construction.

(See March, 1941, *Proceedings* of Am. Soc. C. E., pp. 467–472, for a discussion of research on rigid frame knees and of the difference between European and American viewpoints and design practices.)

Acknowledgments for information and illustrations are made to "L'Ossature Métallique," Brussels, and its former editor, Leon G. Rucquoi (now a resident of the United States). Also to H. W. Clark, bridge and steelwork assistant, London Passenger Transport Board, and M. Schmit, consulting engineer, Paris, designer of the Joncherolles bridge.

Water Supply Troops Organized

A NEW WATER SUPPLY BATTALION, the first organized in the U. S. Army since the World War, will be formed in August at Camp Livingston, Louisiana, as part of the Third Army. The unit, the 80th Engineer Battalion, Water Supply, will consist of a battalion headquarters, headquarters and service company, three lettered companies, and attached medical personnel. Its strength will be 19 officers and 407 enlisted men.

A water supply battalion is equipped to pump, purify, store, and transport water, and has medical personnel to test the quality of the water. To carry out its function of supplying water supply within the field army, the battalion contains 9 mobile water purification trucks and ninety 750-gal. tank trucks, together with other motor vehicles for administration.

Responsibility for the supply of potable drinking water to the troops in a theater of operations, rests on the Corps of Engineers. The divisional engineers are responsible for the supply of water within the Division, corps engineers within the Corps, and water supply battalions within the Army and GHQ. Therefore, in addition to the equipment carried by the water supply battalions, there is water supply equipment carried by all combat engineers and certain other special engineer units. This equipment consists of a portable water purification unit, two 3,000-gal. canvas storage tanks, pumps, hoses, etc.

Portable purification units

The mobile water purification unit, carried by water supply battalions, consists of a gasoline-engine-driven centrifugal pump, dry chlorine feeder, alum and soda ash pots, 42-in. pressure sand filter, and piping, hose, and laboratory facilities. The entire unit is mounted on a truck and weighs about 8 tons. Under normal field conditions, this unit can chlorinate and filter about 4,200 gal. of water an hour.

The portable purification unit, carried by the combat engineers, consists of a 17-in. pressure sand filter, gasoline-engine-driven centrifugal pump, calcium hypochlorite solution feeder, alum and soda ash pots, laboratory facilities, and necessary piping, tool boxes, and tubular frame. The portable unit has a gross weight of about 750 lb., may be transported in any standard one-half ton truck or trailer, and is set up for operation directly on the ground. Under average field conditions, this unit can chlorinate and filter about 600 gal. an hour.

Both the mobile unit and the portable unit were developed by the Engineer Board at Fort Belvoir, Va., after exhaustive tests and experiments.

Classification System for Composite Soils

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***Contents in Brief**—A size classification of natural soils is proposed, which also takes into account grain-size distribution. The class designation is made on the basis of fineness, dispersion of grain size and type of grading. Single classification numbers alone are enough to indicate different size classifications.*

An IMPORTANT PROBLEM in the development and coordination of our knowledge of soil mechanics is the classification of soils into groups that have fairly uniform physical properties and fairly well-known behavior characteristics. The first step in this direction is a general size classification. The classifications commonly used are the M.I.T., the International and the Bureau of Soils, in which certain size fractions are defined, the distinction being entirely one of difference of grain size. These classifications concern the components of soil only; a classification is needed for composite materials such as natural soils. This is the classification proposed. By it the materials can be classified, visualized and described from the class designations without the use of special charts or diagrams. Also the classification is flexible enough to be made as general or as specific as the nature of any particular investigation may require.

The M.I.T. size classification of soil fractions is used as the basis for the new classification, but practical modifications are made: (1) The lower limit between clay and colloids and the subdivisions of clay into coarse, medium and fine are eliminated, as they have little real significance. (2) An overlapping region is made for the classifications of silts and clays from 0.006 to 0.002 mm. While the size limit between silts and clays is important it cannot be fixed definitely at any particular grain size, and the mineralogical and chemical compositions of the true clay sizes are of much greater importance than grain size.

The grain-size distribution curves of natural soils not only vary greatly in general fineness, as defined by the general size classes (gravels, sands, silts and clays), which have been widely accepted by engineers for classification purposes, but they also exhibit a great divergence of slopes, curvatures and terminal points. A size classification, to be of practical use, must first permit of positive identification of these composite materials, and second must furnish a suitable means of designation on the basis of the fundamental characteristics[2] in which the grain-size distributions of soils may differ.

Fineness of the soil

The purpose of a fineness designation is to place the soil on the basis of its central tendency in a size class having fairly uniform physical characteristics. The desirable properties of a fineness designation from a scientific point of view are: (1) It should be based on the entire grading curve; (2) it must be rigidly defined and possess some simple significant property, and (3) it must be easily determined. It is obvious that an arbitrary designation of fineness, such as the 10 percent or effective size of Hazen[3], or the median size of Campbell[4] cannot be considered adequate for materials of such extremely variable composition as natural soils.

The fineness of a soil is best typified by a "mean grain size" the geometric mean for a semi-log plotting, which can be determined by an extremely simple graphical method. The mean grain size is defined by the 50-percent point of the mean slope of the grain-size distribution curve, as shown in Fig. 1. The mean slope is that slope which makes a minimum of the plus-and-minus areas enclosed by: (1) the mean slope, (2) the grading curve and (3) the axes, and also balances about the mean slope each side of the 50-percent point. The mean slope is determined quickly and accurately enough for practical purposes by

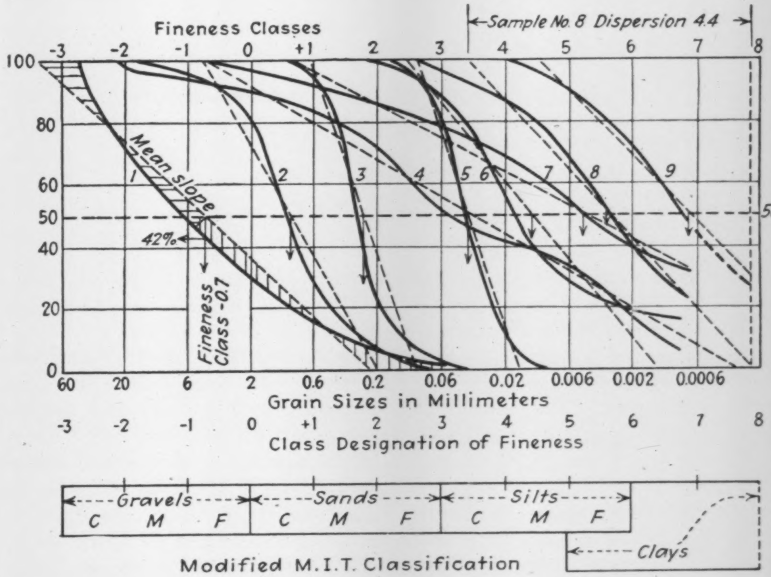

Fig. 1. Grain-size distribution curves illustrating method of determining size characteristics of soils (fineness class and dispersion of grain sizes).

graphical means, using a transparent scale and balancing the areas by eye, as illustrated for a number of types of grading curves in Fig. 1. But instead of using the actual grain-size it is more convenient and simpler to designate the fineness of a soil in terms of the simple number scale of size classes shown in Fig. 1. A reference value is selected at 2.0 mm., the size limit between sand and gravel. Such a reference point makes the fineness of most common soils positive, excepting only the very coarse gravelly materials. The reference also has a certain physical significance, because in this region of soil size there is a change in capillary tendencies and other physical properties.

TABLE I—CLASS DESIGNATON OF DISPERSION OF GRAIN SIZES

Dispersion in fineness classes	Description
0–1	Soil fractions of the M.I.T. size classification coarse, medium, and fine.
1–2	Uniform, well-assorted soils—coarse to medium, or medium to fine.
2–5	Moderate dispersion—in general assorted soils but with some material coarser and finer than the fineness class.
5 and greater	Extreme dispersion—unassorted soils with grain sizes graded over a very considerable size range coarser and finer than the fineness class.

Note—The dispersion extends half way either side of the fineness class.

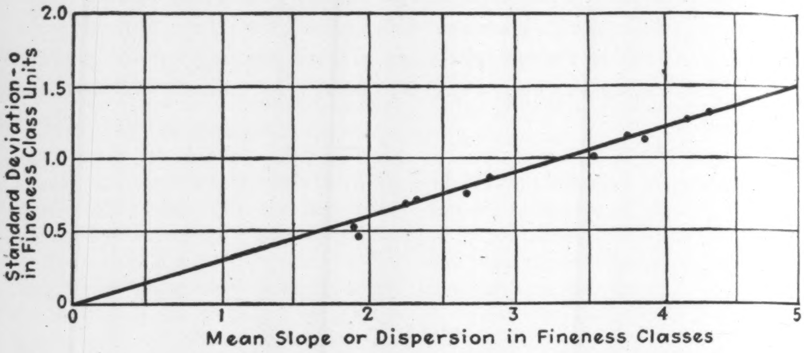

Fig. 2. Relation between standard deviation and mean slope of grading curve.

Dispersion of grain sizes

Soils having the same fineness may differ fundamentally with respect to the uniformity or dispersion of sizes, and consequently exhibit important differences in their behavior characteristics. Hazen,[3] Campbell,[4] and others[5] have recognized that the dispersion of grain sizes is associated in a fundamental way with the general slope of the grain-size distribution curve. Steep grading curves indicate soils of uniform grain size, and flat-sloping grading curves indicate materials with a wide range of grain sizes. The standard deviation from the mean, used in statistical analyses, provides the only satisfactory general measure of the dispersion of grain sizes from a scientific point of view, but because of the time involved in its computation it has been little used.

Fig. 2 shows that the mean slope is directly proportional to the standard deviation. There is a mathematical basis for this relationship for regular soils, which is approximately correct for irregular gradings. This significant relationship provides an extremely simple, practical method for determining the dispersion of grain sizes. The dispersion is simply designated as the number of fineness classes intercepted between the terminal points of the mean slope, where it cuts the 100-percent and 0-percent axes, and extends halfway on each side of the general fineness classes.

The mean slope method thus defines not only the fineness of the soil but also the dispersion of grain sizes, and it has a perfectly general application. The method gives due weight to the bulk of the material as well as to the coarse and fine extremes of sizes. Furthermore it more adequately extends an equivalent dispersion beyond the limit of the usual hydrometer analysis, as illustrated in curves 7, 8, and 9 of Fig. 1. The dispersion in this case is twice the number of finesness classes intercepted between the 100-percent and the 50-percent points of the mean slope, but a subscript *c* is added, denoting that the grain-size distribution extends into the region of colloidal clay sizes. Classifications with respect to dispersion are given in Table I.

Types of gradings

The third characteristic of the grading curve is its form or shape[2, 4] that is, whether it is typically *S*-shaped, cancave-upwards or convex-upwards, as illustrated by the type gradings of Fig. 3. To specify the type of grading indicates the shape of the curve with respect to the mean slope, and also indicates the relative importance of the fine and coarse extremes with respect to the bulk of the material. There are two reasons why the type of grading is important and significant:

First, it has been found that a certain geological significance can be attached to the form of the grading curve.[2, 4] Practically all soils which have been subjected to the assorting action of flowing water, wave action or wind action during their deposition have type *S* gradings. The soils will vary in fineness over quite a size range (gravels, sands, silts), depending on velocity conditions, but they will have a relatively narrow dispersion of grain sizes varying from about 1 to 3. Type *C* gradings which are concave upward, seem to be typical of certain roughly-assorted, coarse, modified glacial or outwash deposits, of coarse gravelly alluvium and piedmont deposits, and of certain types of residual soils. Glacial tills frequently have type *D* gradings, which represent unassorted mixtures of coarse and fine materials with a deficiency of intermediate sizes, a reverse *S*-shaped curve. Certain sandy clays of residual origin and in general mature residual soils[4] tend to have type *E* gradings, which are convex upward, likewise the clays and silts of tidal marshes because of flocculating action of seawater.

Second, experience and investigation[2] have shown that the packing qualities and density of soils vary greatly, depending on whether the grading curve is *S*-shaped, concave-upwards or convex-upwards. Materials with type *C* grading (approximately the Talbot grading)[6], and which have a wide dispersion of grain sizes, are considered to be well-graded. Experience has shown that such materials pack well to form a very dense mass, and consequently such gradings are ideal for subgrades of highways, for stabilized earth roads and for rolled earth dams.[2, 6] It is important to notice that in nature such materials tend to be deposited in a fairly dense state, which makes them good foundation materials. On the other hand the finer soils such as fine sands and silts, particularly those having a dispersion of grain sizes less than about 3 and types *E* and *S* gradings, are almost always found in a very loose state, which makes them poor and uncertain for foundation use.

Classification of soils

A definite size classification can therefore be made by means of a symbol designation—(fineness, dispersion, types). The first number places the soil in a certain size class according to its central tendency as shown in Fig. 1. The second number modifies this classification in an important way and describes the degree of uniformity or variability in the dispersion of grain sizes as indicated in Table I. The letter designation indicates the type of grading with respect to the mean slope, as shown in Fig. 3. When these three size characteristics are specified, any grading curve can be redrawn, if desired, with a very considerable degree of accuracy.

For general classification purposes only, whole numbers may be used, giving the fineness class and the dispersion of grain sizes, a type *S* grading being assumed. For more specific classification the numbers are estimated to the first decimal place, and the type of grading is included. The M.I.T. size classification, modified as shown in Fig. 1, with the simple number scale of fineness classes, can be easily written down from memory at any time for visualizing the materials designated, and for obtaining an accurate and complete size description of the soils.

TABLE II
CLASSIFICATION OF COMPOSITE SOILS

Predominating size fraction or fractions—50 percent or more. One size class either side of Fineness class.

Modifying Terms	Percentages of Size Fraction
"and"	40 to 50
"some"	20 to 40
"little"	10 to 20
"trace"	0 to 10

"Some"—also described as sandy, silty, gravelly.

All soils designated as clay that contain more than 30 percent of grains finer than 0.002 mm.

For smaller amounts of clay sizes soils may be described as "clayey" (equivalent to "some").

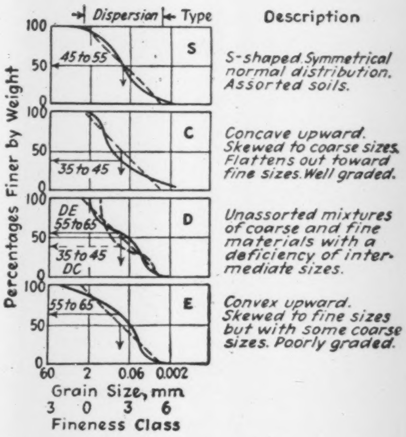

Fig. 3. Types of grading curves and the characteristics of soils indicated by shape of curve. The grading curves shown all have the same fineness and dispersion.

A descriptive classification of composite soils can be made on the basis of the modifying terms in Table II which are in quite common use. As an illustration, the symbol and descriptive classifications, respectively, of soils 2, 5, and 8 of Fig. 1 are given as follows:

2. (0.6-2.8-S) Coarse to Medium sand, some fine gravel.
5. (3.4-1.6-S) Coarse Silt, some fine sand.
8. (5.6-4.6-S) Silty Clay, trace of fine sand.

Use of the designations

The size designations provide a useful and convenient means for indicating the different classifications of soils encountered in soil profiles and on soil maps in connection with studies of the general suitability of soils for highway subgrades and embankments, for different types of earth dams or for foundations. The designation can be made as a simple fraction as follows—

$$\frac{\text{Boring No.—Sample No.—Depth}}{\text{Fineness—Dispersion—Type}}$$

The classification is flexible enough so that it can be made as general or as specific as the nature of the investigation may require; and for maximum usefulness it is capable of expansion ultimately to include those physical properties of soils that are found to be of vital importance in relation to their behavior under the particular circumstances. For example, such properties as the percentage of fines passing the No. 100 sieve, the maximum density, permeability, blows per foot to drive the sampling spoon, or any other physical property of particular significance may be added or substituted in this symbol designation to give as complete and as specific information as possible.

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Illinois Checking Public Water Supplies

Of the 663 public water supplies in Illinois, 209 are considered by sanitarians to be subject to contamination, according to Dr. Roland R. Cross, director of the state department of public health.

"These water supplies have been inspected by the state's public health engineers," Dr. Cross said, "and recommendations for the correction of sanitary defects have been made. The purpose of recommended improvements is to protect the population from water-borne epidemics of dysentery, typhoid fever, and the like. The actual installation of the necessary safeguards, however, depends upon the local authorities. The state has at present no power to enforce protection of municipal water supplies."

Currently before the Illinois Senate are bills on the control of public water supplies and on the certification of water supply operators, the passage of which would make it a legal requirement that all public water supplies be maintained and operated to produce assuredly safe water.

Commenting on these two bills Dr. Cross stated that there had been 25 major water-borne epidemics traced to faulty public water supplies in Illinois since 1920, resulting in an aggregate of more than 10,000 cases of dysentery and typhoid fever, with more than 200 deaths.

Emergency Sewage Treatment

Edward A. Smith

Assistant to the Constructing Quartermaster
Camp Croft, Spartanburg, S. C.

Contents in Brief *— To provide sewage disposal facilities for several thousand troops which arrived at Camp Croft before construction was completed, a settling "tank" was dug and a simple chlorinator device installed. This sedimentation-sterilization scheme was effective in preventing stream pollution.*

When Camp Croft in Spartanburg, S. C., was confronted with the necessity of providing occupancy for troops 45 days before the scheduled date of completion, an emergency situation was created with regard to sewage disposal. What was done to provide temporary sedimentation and chlorination facilities proved to be a successful, cheap and sanitary expedient.

Late in January — less than two months after construction started—it was learned that provision would have to be made for sewage disposal before the possible completion of the pumping station that was to deliver the sewage to the treatment plant of the city of Spartanburg. After a hurried consultation with J. H. Stephens, chief engineer for the South Carolina state board of health it was decided to construct a temporary settling basin with a separate dosing basin for chlorine application. The small creek into which the effluent was to be discharged had a winter flow of from 200 to 400 gpm. and dilution alone was not considered sufficient for safety.

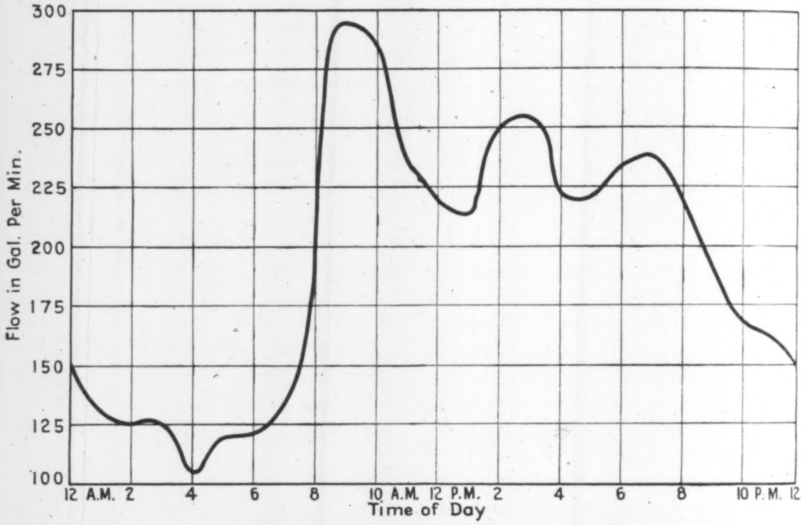
Based on information that 10,000 trainees out of the total 18,400 would be in camp before April 1, and assuming a flow of 70 gal. per capita and fixing two hours as the desirable detention period for sedimentation, a basin 100 by 30 by 5 ft. deep was selected. A detention of 20 min. for the dosing chamber fixed its size as 40 by 15 by 5 ft. deep. A peak flow of twice average was assumed.

The basin excavations were made in a level section of the creek valley adjacent to the pumping plant, and the two main outfall branches were bypassed into them; the inlet was located on the median line of the larger basin. A solution of high-test calcium hypochlorite (containing 70 percent available chlorine) was mixed in three wooden barrels interconnected to give 24-hr. dosing capacity. The rate of dosing was begun at 5 ppm, then increased gradually until tests made about 100 yards downstream showed a slight chlorine residual. Average dosing was equivalent to 8 ppm. Use of a wooden spigot and a section of rubber hose worked out well as a diffuser device for the chlorine, which was applied just as the flow entered the smaller basin.

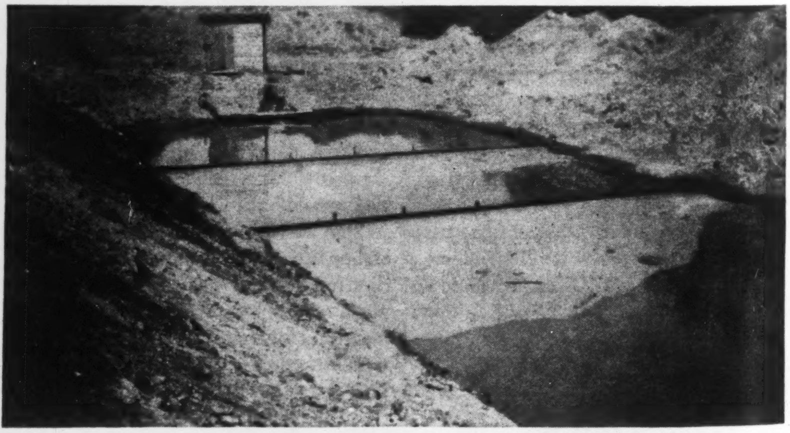
An 18-in. Cippoletti-type weir was installed at the outlet and read at 30-min. intervals for a three-week period in March when the contributing population was practically constant at 2,150. A composite sample of the raw sewage and also of the effluent was taken over a 24-hr. period each week

SEWAGE CHARACTERISTICS AT CAMP CROFT

Biochemical oxygen demand	
Raw	215 ppm.
Settled	115 ppm.
Suspended Solids	
Raw	472 ppm.
Settled	165 ppm.



Sewage flow characteristics with a contributing population at 2,150. The flow shown is the average taken over a five-day period.



Temporary sedimentation "tank", which was simply an excavated hole that later was drained and backfilled. The sludge deposit was estimated to be 200 tons.

and given careful analysis by W. G. Willard, engineer for the Spartanburg Metropolitan Sewage District. The efficiency of the treatment and some characteristics of camp sewage are shown in the accompanying table.

The camp population had increased to about 8,000 when the pumping plant was ready for operation in early April. The basins were then drained, dosed with 1,000 pounds of lime and backfilled. At no time were there offensive odors and no complaints came from the downstream residents.

Major N. R. McKay is serving as the constructing quartermaster at Camp Croft. Harwood Beebe Co. are the cantonment engineers and the Carter, Jones and Boyle companies were associated as contractor.

Experience in California With Cement-Treated Road Bases

A NUMBER of road construction projects in California have used a type of pavement base constructed with a low cement ratio and compacted mechanically at optimum moisture content. These jobs have recently been compared and analyzed from the cost standpoint by F. N. Hveem, senior physical testing engineer, California Division of Highways, in a paper prepared for the fourth Arizona Roads and Streets Conference. Although the costs naturally vary a great deal with conditions peculiar to each job (such as length of haul, base thickness, width, traffic requirements, etc.) at least some average data can be obtained from the figures assembled. The essential data are reproduced in the accompanying table.

Cement-treated base construction in California began in 1937 using the road-mix principle. Later, it was decided that plant-mix methods would produce more uniformity and more satisfactory results and subsequent contracts were let on this basis. Although "results have not been uniformly 100 percent satisfactory," Mr. Hveem said, "the major portions of the work indicate that sound, economical bases can be constructed in this manner and it seems only necessary to improve preliminary test procedures and to tighten up somewhat on specification details in order to secure consistently good results."

With usual testing procedures, to be considered acceptable, specimens must develop more than 100 lb. per sq. in. compressive strength and show less than 2 percent loss in the durability tests. Three types of mixers have been used, double-shaft pug mill mixers, single-shaft paddle mixers and revolving drum concrete mixers. The double shaft pug mill has been the most satisfactory. Special care is necessary to prevent lack of uniformity in the cement distribution; it is highly desirable that the discharge of the cement into the other materials be so arranged as to distribute it through the batch either at the time of introducing into the aggregate weigh box or into the mixing chamber.

In the matter of moisture control, experience has indicated that moisture content at the time the material is compacted should be slightly above that indicated as optimum by laboratory methods. A most important factor affecting the strength of the mixes is the degree of compaction achieved and this in turn is likely to be affected materially by moisture content. "If too much moisture is added," Mr. Hveem says, "a jelly-like mix develops under the roller which prevents proper compaction. Careful and unflagging attention to moisture content and compaction is most essential to secure the best results." In spreading operations, various equipment has been developed to level up inequalities and to reduce the amount of later shaping and trimming required.

For the curing, the California plan now is to specify an emulsified asphalt topping since it has been found that samples cured under a properly placed film of asphalt are virtually as strong as those cured in sealed containers.

The reason for wide differences in compressive strength is not altogether evident, Mr. Hveem pointed out, "although it has been observed that in nearly all cases the compressive strength will vary directly with the compaction and density achieved." On the job that showed the lower strengths the average weight per cubic foot of dry aggregate was 126 lb.

Costs do not vary widely between plant-mix and road-mix operations. The range has been from $1.50 to $2.00 per ton including all materials and labor of placing. On a mileage basis total costs are about $12,000 per mile where the pavement sections include a cement-treated base, 6 in. thick and 24 ft. wide, and are topped with 2 in. of dense-graded asphaltic plant mix 22 ft. wide.

SUMMARY OF COSTS AND CHARACTERISTICS OF CEMENT-TREATED ROAD BASES IN CALIFORNIA

Type of Processing			Road Mixed				Plant Mixed				
Project			A	B	C	D	E	F	G	H	I
Dimensions		Length (Mi.)	1.019	1.0	3.0	3.35	5.95	6.12	11.02	8.04	3.34
		Width (Ft.)	24	22	22	24	24	25–27*	23–25	23*	7.5
		Thickness (In.)	10.3	6	6	5.5	6	6–9	6–9	6	6
Cost Data	Total for project		$11,220	$4,778	$18,278	$14,750	$39,280	$54,953	$80,660	$19,607	$10,286
	Per unit of one	Mile	$11,010	$4,778	$6,093	$4,396	$6,547	$8,979	$7,319	$6,450	$3,080
		Mile, 1 in. thick	$1,069	$796	$1,016	$799	$1,091	$1,196	$976	$1,075	$513
		Ton	$1.67	$1.49	$1.98	$1.44	$1.54	$1.45	$1.26	$1.45	$1.92
		Cubic yard	$2.74	$2.22	$2.85	$2.01	$2.93	$2.45	$2.41	$2.53	$3.77
		Square yard	$0.782	$0.370	$0.472	$0.31	$0.49	$0.51	$0.593	$0.42	$0.70
		Sq. yd., 1 in. thick	$0.076	$0.062	$0.079	$0.056	$0.082	$0.068	$0.067	$0.07	$0.116
Physical properties		Cement cont. % by wt.	4.9	7.8	8.8	7.5	6	6 & 7	6	7	7
		Moisture when placed	18.8	11.5	13.8	14.9	6.3	10.9	6.2	9.5	6.0
		Compd. dry wt., cu. ft.	121	110	107	104	140	125	142	129	145
		Relative compaction, %	93.8	92.7	93	90.2	100	95	102	97	100
Compressive strength (lb. per sq. in.)	Daily Test	7 days	....	....	....	....	1,700	720	1,215	845	1,155
		28 Days	495†	565†	320†	500	2,130	875	1,760	1,110	1,365

*Variable width.

†Test specimens made by hand-tamping treated material into 6 x 12-in. concrete cylinder cans.

BUILDING DESIGNERS' LIBRARY

Principles of Ventilation by Wall and Monitor Windows

E. W. Conover
Detroit Steel Products Co. Research Engineer,
Detroit, Mich.

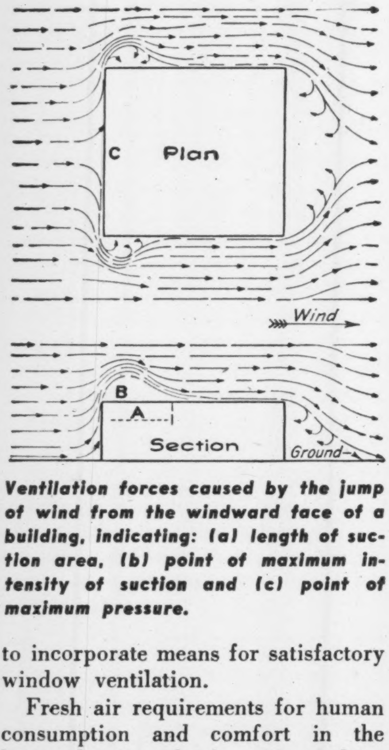
***Contents in Brief**—Natural forces resulting from (1) temperature difference and (2) wind, which are always available for ventilation, should be understood as to magnitude and effect in the planning of building projects. Of relatively small unit power, these forces can move tremendous quantities of air in and out of buildings. Principles of ventilation by windows reviewed and design requirements outlined.*

Industrial Buildings are ventilated either by the natural forces of wind and temperature difference or by mechanical systems. As the natural forces are always existent, it is to the engineer's advantage to know about them, their magnitude and extent, whether he wishes to utilize them or not. Even in mechanical ventilation, it is desirable to know that such natural forces exist and how they work in order that they may be employed in such a way as to render their effect useful rather than oppositional in character.

Data from research

As manufacturers of steel windows, my company, realizing that reliable methods for predicting daylighting and natural ventilation (airation as we prefer to call it) would be of value to the architect and engineer, sponsored an extended research program at the University of Michigan to study the problems involved. Accurate application of the principles discovered now makes it possible to have pre-construction knowledge of daylighting and natural ventilation so that a building will not prove disappointing in these requirements when occupied.

Since this article is confined to the principles of designing for natural ventilation, the subject of daylighting will not be mentioned excepting to say that if the fenestration is designed to produce adequate and well distributed daylight, it is usually possible to incorporate means for satisfactory window ventilation.



Ventilation forces caused by the jump of wind from the windward face of a building, indicating: (a) length of suction area, (b) point of maximum intensity of suction and (c) point of maximum pressure.

Fresh air requirements for human consumption and comfort in the home, theatre, school or store, where people are in a state of comparative rest, are considerably less than those in a factory, where they are laboring and are frequently hampered by products of manufacturing processes, such as heat, smoke, fumes and dust. Each building is usually a problem in itself and, depending on the industrial processes housed therein, the air changes required may vary from as low as three to as high as thirty or more per hour to obtain comfortable and satisfactory conditions.

Summer usually presents the time when the greatest amount of ventilation is required since a smaller difference in temperature between inside and outside air is necessary, and a more rapid flow of air over the workmen promotes comfort. Consequently, if a building is designed to provide satisfactory conditions in the summer, the amount of window opening can be reduced to provide winter requirements.

Natural ventilation forces

There are but two natural forces available for producing ventilation: (1) temperature difference, and (2) the wind. The forces of temperature difference may be referred to as the chimney effect, which acts vertically to lift air out of a building, while the wind is a horizontal force to move air through parallel to the ground. In most cases, however, there are windows or other openings located in the roof where air may be forced in or out by the wind, and a vertical component of the wind's force is created, which must be coordinated with that due to temperature difference if the building is to be successfully ventilated.

These natural forces, while of small unit power, can move tremendous amounts of air into, through and out of a building. In some field surveys of actual buildings in operation more than 3,000,000 cu.ft. of air per min. have been recorded. Calculating the amount of mechanical equipment necessary to move the same amount will give some idea of the importance of allowing these free forces to do the work. However, it is not so much the great volume that is important as it is adequate volume correctly distributed and controlled.

Everyone is familiar with the fact that heated air rises and cooler air then moves in to take the place of the warm air that has been displaced. To predict the effect of this flow, it is necessary to be able to express the magnitude of the displacing force and to calculate the quantity rate of flow induced by it. The force itself is directly proportional to the vertical distance between lower and upper openings and also to the difference in temperature and the rate of flow is proportional to the square root of the head or force.

As soon as the heated air is removed, the displacing air must be heated in order to continue the process. Consequently, if we know how much heat is being generated by the manufacturing processes, the power equipment, the laborers, etc., say, in B.t.u. per min., it is easy to calculate the amount of air necessary to pass through in order to maintain any desired temperature difference. The amount of heat absorbed by flowing air in B.t.u. per min. may be expressed by the equation $H = 0.0175Q\,D$, where Q is the quantity of air in cubic feet per minute and D is the temperature difference between incoming and outgoing air.

Force due to temperature

The actual force exerted by temperature difference is the difference in weights of the column of warm air and that of a similar column of the cool air. Air will flow in at lower openings because the atmospheric pressure is greater outside than inside by an amount equal to the difference in weights of the two columns of air. Likewise, it will flow out at upper openings because the pressure is greater inside. Somewhere between these openings, there is a level at which the inside and outside pressures are equal.[1] At this level, called the "neutral zone," there would be no temperature difference force to cause flow through any openings. Openings located below the level of the neutral zone would have inflow, and any located above would have outflow. The force causing flow through any opening is proportional to its vertical distance from this neutral zone. Consequently, openings about mid-height are of little value.

Obviously, if air enters a building at any opening, a similar quantity must get out at some other opening. If both inlet and outlet openings are of the same area and at two levels only, the velocity of air flow will be the same through each end and the neutral zone will be exactly at mid-height. Under such a condition, the effectiveness of the openings, as represented by the average flow per square foot, is a maximum.

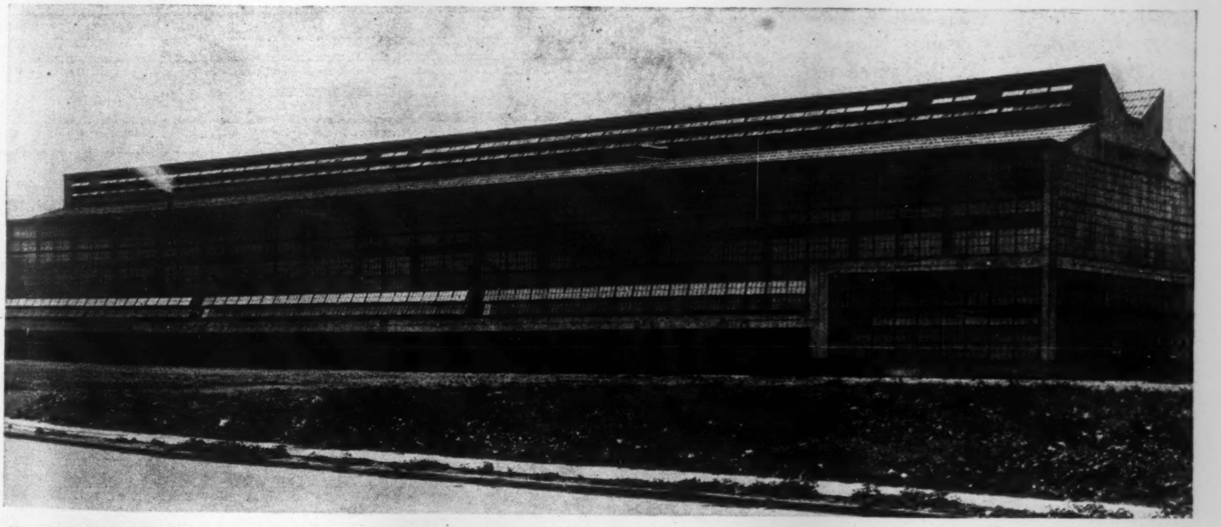
If outlets are increased in area over inlets, or vice-versa, there will be an increased flow but not to the extent represented by the increased area. For example, if the outlets are doubled without increasing the inlets, the air flow will be increased about 26 percent. When there is an unequal distribution, it is the smaller area which becomes the chief factor in determining the amount of flow.[2]

The wind and its effects

The ventilation produced by the wind depends upon its speed and direction, the area of the inlets and outlets and their distribution about the building. The accompanying illustration indicates how the wind acts when striking a building or other obstruction. As the stream lines are stopped or caused to change direction, a pressure is built up along that face. This localized area of higher-than-atmospheric pressure will cause a lateral and vertical flow around the building and the stream lines thus generated will tend to shoot past the boundaries or edges of the windward face, but the pressure of the oncoming wind bands these lateral stream lines towards its own direction of flow. The wind thus appears to "arc" around the corners of the buildings, leaving areas of quiescent space near the windward end, both at the sides and the roof.

These regions enclosed by the deflected air streams are regions of less than atmospheric pressure, or suction. Another region of suction is created as the stream lines "jump off" or leave the lee side of the building.

With the creation of both pressure and suction zones, it is evident that the wind has two actions in the pro-



Air flow resulting from difference in temperature is handled by window openings located above and below the "neutral zone" illustrated by the open windows along the lower wall and the monitor.

duction of ventilation. It will force air in at openings located in the walls subjected to pressure, and it will tend to pull air out through openings located in walls or roof within suction zones. Openings located where neither pressure nor suction occur may have either inflow or outflow.

The greatest suction force is exerted directly back of the face or wall obstructing the wind. This force decreases to zero somewhere downstream in practically a straight-line ratio. The distance it extends back has been found to be a function of the area of the obstructing face. On the other hand, the distance is independent of the velocity of the wind. The velocity of the wind determines the intensity of the suction only. Consequently, it is possible to determine the suction zones and their extent for any given building design and relative direction of the wind.

Orientation of building

Since the extent of the suction zones is a function of the area of the obstructing or windward face of a building, the logical positions to assume the maximum pressure and suction zones, with consequent maximum air movement through the structure, is to have the long dimension perpendicular to the wind.

When the wind is blowing parallel to the long dimension of a building the maximum air disturbance is concentrated at the windward end and little or no effect is produced over the greater portion. The fenestration usually will provide more opening area in the suction zones than in the end wall under pressure. Consequently, all the air that is forced in there will be exhausted soon after it enters. In fact, the demand for air at openings in suction may be so great that it will create a movement down the length of the building towards the windward end. This is frequently objectionable, especially in buildings where heat, smoke or fumes are present. It may be corrected by closing outflow openings near the windward end, or by raising that portion of the building over these processes so that another obstruction is provided for the wind to strike and create a secondary "hop" with its consequent suction zones.

In every locality, the wind blows from one direction the greater part of the time for practically the entire year. Consequently, a building may be designed and oriented to take advantage of the prevailing direction.

Monitor or roof openings

As a general rule, monitor or roof-openings are provided to exhaust the air, smoke, fumes, etc. If air is permitted to enter at these upper openings, it seeks the nearest passage out and thus decreases the capacity of the outflow openings for removing the vitiated air from the zone of occupation below. When this occurs, improved results will be secured if the upper inflow openings in the pressure zone are closed. The general reaction to uncomfortable conditions is to think that they can be bettered by opening all windows, but such does not prove to be the case.

In the case of large buildings covering huge floor areas, the central portion may be too far away to be benefitted by the natural inflow openings in the sidewalls. For such conditions, it is necessary to use some roof openings to provide fresh air to this area. This may be done by using some windward monitor openings for inflow and closing the leeward openings in the immediate vicinity so that the air may be carried down, through the building and out again at some distance from its entrance.

The amount of flow through any opening is determined by the pressure or suction forces causing flow, the area of the opening and a factor called the resistance of the opening to flow. Tests have shown that there is no material difference in the resistance of windows that are horizontally pivoted, top hung, bottom hung or vertically pivoted. In fact, any openings used in buildings, whether windows of any character, plain holes, short stacks or roof ventilators, when placed where the same forces will be acting on them will give practically the same air flow per unit of area.[3]

When both wind and temperature difference are acting together, the flow, due to the combined forces, is not the sum of that produced by each acting independently. The air flow is proportional to the square root of the combined heads or forces. When one force is fairly strong, the addition of a weaker force does not add a great deal to the total flow.

If it is desired to calculate the air flow through a building for given wind and temperature difference, the correct method would be to determine the magnitudes of the pressures and suctions acting at each opening or group of openings, and solving for the flows, keeping in mind that total inflow must equal total outflow. Simplified methods, which give a fair degree of accuracy for the majority of factory buildings, are now available and can be used to compare different designs and fenestrations.[4]

Principles of design

Window openings are presumably installed for the passage of air. The best place to install them is where the maximum amount of head or aeromotive force is available. While not always possible to design a building so that every desirable feature is incorporated, the following suggestions should be given consideration:

1. If the building is rectangular in shape have the long side perpendicular to the direction of the prevailing wind.
2. Place heat processes at the windward end or side. If this is impossible to do, have them under a portion of the building that is higher than the rest.
3. Provide inlet and outlet openings of equal area. Since it is usually advisable to have windward monitor windows closed, the total roof openings provided for should be greater than the total in the sidewalls.
4. Window openings, both sidewall and roof, should face more than one direction, preferably all four.
5. When heat is present, the inlets should be low and the outlets as high as possible. Mid-height openings are of little benefit. If all openings are at one level, no flow will be caused by heat head.
6. Buildings housing heat processes, such as foundry work or forging, will require considerably more air than assembly plants or machine shops.
7. Air movement, created by natural means, is directly proportional to the amount, or size, of the window openings provided.
8. Both inlets and outlets must be provided as air will not flow out unless air to replace it can get in and vice versa.
9. Window openings on the windward side should not be obstructed by other buildings, sign boards, etc., outside, nor by partitions inside.

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[1] See *The Neutral Zone in Ventilation*, by J. E. Emswiler and W. C. Randall. Engineering Research Bulletin No. 3. University of Michigan.

[2] See *Industrial Airation by the Fenestra Method*, Published by the Detroit Steel Products Co., Detroit, Mich.

[3] See *Airation of Industrial Buildings*, by W. C. Randall. Transaction of A.S.H. & V.E., 1928.

[4] See *Predetermining the Airation of Industrial Buildings*, by Randall and Conover, Transactions of A.S.H. & V.E., 1931.

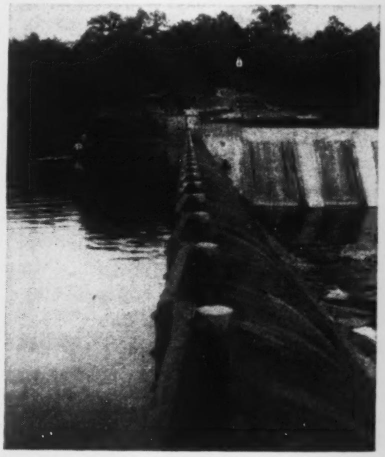
From Field and Office

Working problems and time-saving methods for engineers and contractors

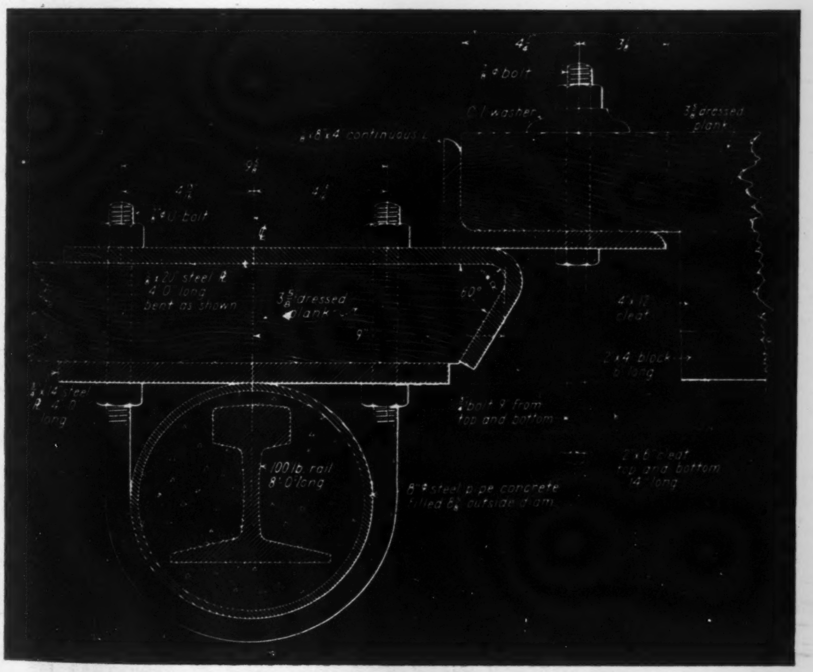
Hinge-Type Flash Gates

Flashing for the 385-ft. spillway at the Belton, S. C., hydro plant of the Belton Light & Power Co. consists of 48 creosoted pine gates 4 ft. high and 8 ft. apart across the spillway top as shown by the accompanying illustrations. The U-bolt mounting for the gates is adjusted to light friction and the bottom seal is wood direct to a 10-in. steel channel grouted to the spillway on the upstream side of the 8-in. pipe pivots. The ends of each gate are reinforced by formed steel plate and angle iron to avoid wear at tips and insure alignment for a good water seal. The flashing gates are grouped in two sets of 24 gates with each set locked in the closed position by a U-bolt over a 1-in. stainless steel pin at each abutment. These pins are then pulled when flood stages are reached. The water then swings each gate 90 deg. to a down-stream position and as it swings an adjoining gate is also released.

The general arrangement of this flashing is shown by the photo and details of pivot are shown by the drawing. This flashing has operated three times without any trouble and when the gates are closed the total leakage barely wets one-tenth of the spillway length. By throwing a rope loop over the tip of a gate two men can easily pull it to closed position. With two crews of three men each we have closed the 48 gates across the 385-ft. spillway in an hour and a half.
—Julian Walton, *superintendent, Belton Light & Power Co., Belton, S. C.*



Flashboards pivoting about 8-in. reinforced columns make it possible for each section to release the next in order as it swings downstream when the end ones are released.



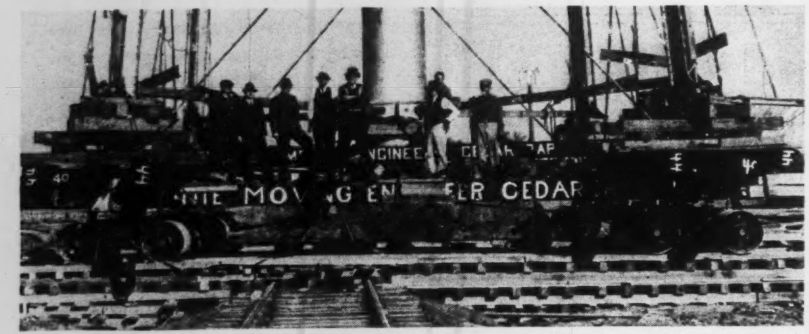
Overlap at each column is about 3 in. with reinforcement of overlap consisting of angle iron and formed steel.

Elevated Steel Water Tank Takes a Ride to New Site

Moving a high elevated steel water tank in upright position for 3½ miles was one of the spectacular jobs involved in shifting the entire town of Shawneetown, Ill., from its former flood-ravaged location on the bank of the Ohio River to safe, higher ground. The 80,000-gal. tank, 132 ft. high and weighing 60 tons, is carried on four latticed steel legs with a spread of 33 ft. in both directions at ground level. The legs are braced by two sets of horizontal struts and light diagonal tierods. A 36-in. steel riser pipe was moved intact with the tank.

The tower was jacked up and loaded onto a carriage consisting of

Shawneetown's water tank remains upright in a move to serve the relocated town. This 80,000-gal. reservoir weighs 60 tons and stands 132 ft. high.

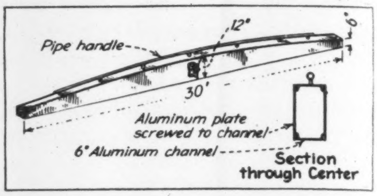


Railroad tracks were taken in stride with other obstacles. This is a good view of the carriage framing.

four sets of heavy-duty 4-wheel dollies tied together by heavy timber framing, which also supported the center riser pipe. In longitudinal direction the dollies were placed under the tower legs, but transversely they were narrowed to 22 ft. apart to permit travel on highways and over bridges. Thus the framing extended sideways beyond the wheels as shown in an accompanying illustration. The carriage and supporting framing weighed 31 tons. Motive power was two crawler tractors.

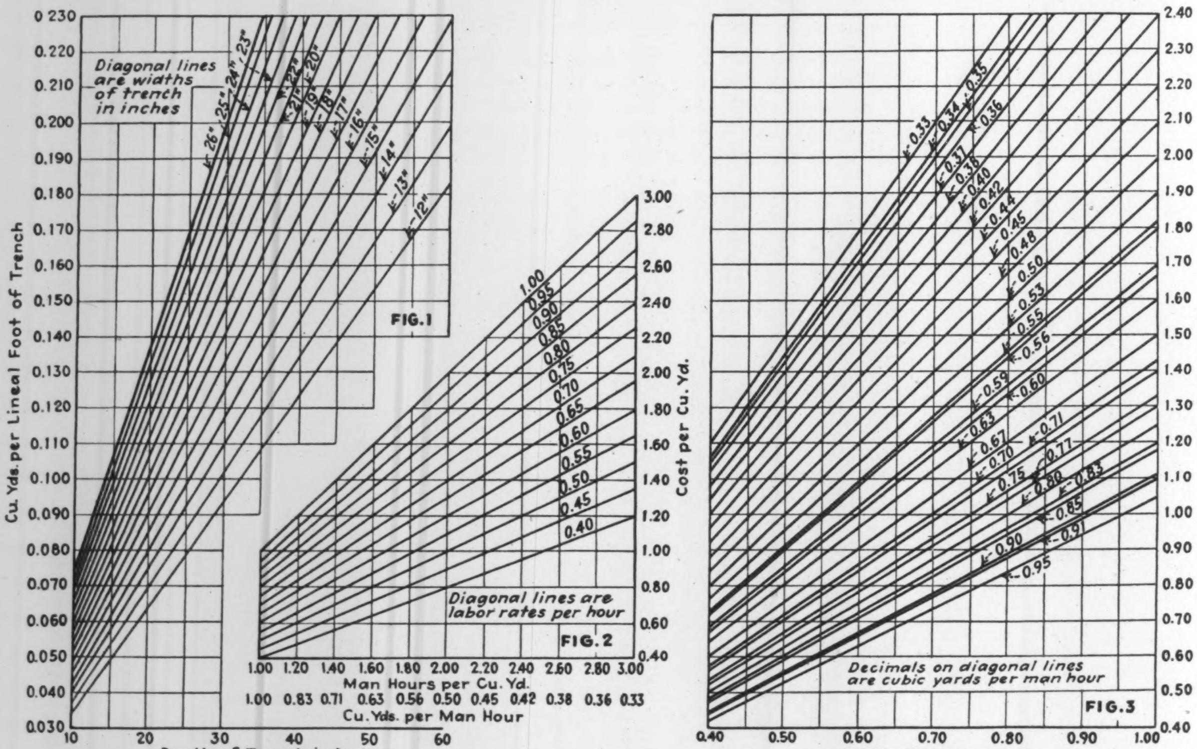
In the 3½-mile journey four corners were turned and one railroad was crossed. Where the roads were narrow or shoulders soft, heavy planking was used as a runway. The railroad was crossed on cribbing at a point off the highway.

The job was carried out without mishap by E. W. LaPlante Co., Indianapolis, Ind., contractors and moving engineers, who had the contract for moving the town, including 300 buildings and a 24x40-ft. concrete bridge. Labor for the project was furnished by the Works Progress Administration. K. F. Adair, general manager for the contractor, was in charge of operations.



ALUMINUM BOX GIRDER AS SCREED AND STAIGHTEDGE

On the Bellevue housing development at Hartford, Conn. workmen of the Wilcox Construction Co., Inc., are finding very useful, because of its lightness, the aluminum screed and straightedge shown above. Made as a box girder with closed ends, the tool is also very sturdy.



CHARTS FOR ESTIMATING HAND TRENCHING OUTPUTS AND COSTS

The accompanying charts will facilitate estimates of hand trenching outputs and costs in the frequent operations in which isolation or the small volume of work or the scattered locations of trenches make machine trenching less practicable. The data that may be read from the charts are plain. For practical use, however, the necessarily small scale of publication requires the charts to be enlarged — J. L. TURNER, Buffalo, N. Y.

Notes on Sewage Disposal

A monthly summary of current developments conducted by Willem Rudolfs

NITRIFICATION DESIRABLE? — Nitrification by biological treatment processes is considered an index of the degree of purification accomplished. Imhoff (*Gesundheits Ingenieur*, 64, 14, 1941) calls attention to the fact that nitrates in purified sewage are a product of secondary reaction of the nitrogen compounds in the sludge and not a sign of complete purification. Under certain conditions a high degree of nitrification may be detrimental to the stream or receiving waters. Examples of this have occurred in this country where the growth of floating and rooted plants were greatly stimulated, causing difficulties, nuisances and additional expense. Formation of nitrification is avoided in high-rate trickling filters and in activated sludge units by restricting aeration. Under certain conditions an undesirable feature may become necessary, but where a high degree of purification is required nitrification appears still to be an excellent guide for the degree of purification and stabilization accomplished.

THIN SLUDGE — Difficulties with thin sludge are reported (*Annual Report*, Bureau of Sanitary Engineering, Maryland, 1940) at the Hagerstown sewage treatment plant, where additional sludge handling facilities have been installed to eliminate a serious odor nuisance resulting from dewatering undigested sludge. The additions consisted of 2-stage sludge digestion, sludge thickening, elutriation equipment and reconditioned drying beds. By the time the activated sludge process was discontinued for the winter completely digested sludge was not obtained and the material in the digesters was exceedingly thin. During the succeeding five months raw primary sludge placed therein failed to digest and settle normally, with the result that by April of 1940 when the activated sludge process was resumed, space for additional raw sludge mixed with waste activated sludge was considerably limited. By the first week in August both digesters were nearly full of thin sludge. At the same time it was observed that the return sludge from the secondary clarifiers was highly diffused and septic.

Under usual operating procedures waste activated sludge is thickened before being placed in the digesters. The character of this sludge, however, was such that its solid content of about 0.7 percent could not be raised above 1.0 percent. Furthermore, the solids content of the supernatant liquor in the digesters increased from 0.2 to about 2.0 percent with the bottom sludge averaging about 2.5 percent. Shortly thereafter it became necessary to filter the mixed raw and waste activated sludge without previous digestion with the result that the ultimate disposal of the dewatered sludge presented a problem because of its malodorous properties. In addition to these difficulties, sludge placed on the reconditioned sludge drying beds failed to drain within reasonable periods of time. Withdrawing supernatant liquor from the secondary digester, dewatering it after elutriation in the thickener, and subsequent chemical conditioning was practiced to relieve the overloaded digester.

CHLORINATION OF REFUSE — Remarkable decreases in volume and moisture content of house and street sweepings by treatment with chlorine are reported by Intonti (*Annali Chemique Applicata*, vol. 30, p. 508, 1940). Treatment of sweepings with 0.5 to 0.6 lb. of chlorine per 100 lb. of material decreased the total volume of the wastes by 45 percent, the weight by 35 to 40 percent, and the moisture content by 37 to 42 percent. Application of the chlorine may be made as a gas or solution mixed with the wastes. The total bacterial content is decreased, but spore-forming organisms are resistant to the treatment. It appears that volume and weight reduction can be obtained by treating garbage and refuse. Those interested in recovery of tin from tinplate or cans should not use chlorine since the tin recovery is reduced up to 38 percent.

SAND FILTER DISTRIBUTORS — It has long been recognized that better distribution of settled sewage on intermittent sand filters is of primary importance. From $\frac{1}{3}$ to $\frac{1}{2}$ of the surface area of the sand bed may carry the entire load of the applied sewage on account of clogging and poor distribution. Stapleton (Proceedings, Ohio Sewage Conference, 1940) described the construction of the self-propelled type of distributor (similar to those used on trickling filters) used at small institutional plants. The distributor applied the settled sewage uniformly over the entire area, producing far better results than the usual wooden troughs with pipes and other more or less unreliable distribution methods. The dosage applied could be increased from 100,000 gal. per acre a day to 350,000 gal.

BATCH DIGESTION — The final concentration of sludge depends upon the original concentration, time and temperature. Alum-coagulated sludge is thinner than sludge obtained by plain sedimentation or by coagulation with iron salts. Since the quantities of suspended solids do not change, the thinner the sludge the greater the digestion capacity required. Fesperman (*Journal*, North Carolina Section A. W.W.A., vol. 16, p. 126, 1941) described his experiences with digestion of mixtures of settled and alum-coagulated sludge, where the sewage contains considerable quantities of dye wastes. Pumping sludge daily for ten days into one digester and letting it stand for ten days before supernatant is drawn improved separation of the sludge from the solids so that a clear liquid can be drawn, which relieved the load on the subsequent trickling filters. Digestion is rapid during the first ten-day period and tapers off the next ten days, so that the digester serves in effect as a concentrator of sludge. The sludge drawn was increased over a period of $1\frac{1}{2}$ years to a density of about 10 percent, resulting in decreased requirements for sludge drying bed capacity. The method of operation is a modification of batch digestion practiced years ago and should work well when sufficient capacity is available.

Book Notes and Reviews

The month's addition to the engineer's reading and reference list

Transit History

FARES PLEASE! FROM HORSE-CARS TO STREAMLINERS—By John A. Miller. 204 pp. Published by D. Appleton-Century Co., New York and London. Price, $3.50.

The history of city transportation from the slow-moving horsecars of a century or more ago to the rapid transit facilities of today is told here in an informing and easily read manner. Especially interesting is the way in which the relation of each major type of city transit to the type that followed it is set forth. Written primarily for the layman, the book will be found none the less interesting to engineers. Especially good are the many illustrations.

For Ship Builders

PRACTICAL SHIP PRODUCTION—By A. W. Carmichael. Second Edition. 283 pp. Published by McGraw-Hill Book Co., New York and London. Price $3.

This text was written originally to meet the needs of technical men lacking experience in shipbuilding who in 1919 found themselves projected into shipbuilding by the increased activity in that field following the first World War. The present edition has been brought out to meet a like situation, but because of rapid advances in welding that have occurred in the past decade, much of the text has been rewritten. The book relates chiefly to the production of ships from existing plans. It is concerned almost wholly with steel ships, giving wooden and concrete ships only passing comment.

Sewage Treatment

PRINCIPLES OF SEWAGE TREATMENT—By Dr. Willem Rudolfs. 128 pp. Published by National Lime Association, Washington, D. C. Price 50c.

One of the most useful texts on sewage treatment yet to appear is this publication sponsored by the National Lime Association. Designed as a companion piece to the association's earlier and widely accepted text on water treatment, this book will make a special appeal to operators for its logical discussion of theory and methods of treatment. The author, Willem Rudolfs, of Rutgers University, has a remarkable ability in presenting ideas so that they can be quickly grasped and understood. His objective in this book is to serve those "who wish to know more about the composition of sewage and the principles of its treatment. . . . but who may lack the time or the training necessary to become experts." Among the ten chapters of the book, one on microbiology and another on plant operating problems stand out as contributions of special merit.

Water Control and Use

DRAINAGE AND FLOOD-CONTROL ENGINEERING—By George W. Pickles. Second edition, 476 pp. Published by McGraw-Hill Book Co., New York and London. Price, $4.

So much progress has been made toward putting flood control on a scientific basis in the fifteen years since the first edition of this text was prepared that almost complete rewriting of the flood-control sections of the text was required. Extensive revision of most of the other sections also was made necessary by new information on rainfall and runoff and by progress that has been made in applying hydraulic studies to drainage and flood control problems.

Miscellaneous Notes on Booklets and Reprints

CORRELATION OF THE GERMICIDAL ACTION of chlorine with the oxidation-reduction potential is discussed in *Bulletin No. 91* of the Michigan Engineering Experiment Station, East Lansing, Mich. Price, 50c.

DATA ON EMPLOYMENT and earnings in the engineering profession, collected by the U. S. Department of Labor in 1935, some of which have been published heretofore by the department, have now been brought together in Bulletin No. 682, Bureau of Labor Statistics, U. S. Department of Labor, under the title "Employment and Earnings in the Engineering Profession, 1929 to 1934." Copies may be obtained from the Superintendent of Documents, Washington, D. C. Price, 25c.

SIGNIFICANT HIGHWAY LEGISLATION passed in recent months is briefly summarized in the 1941 Law Bulletin, (No. 3), of the National Highway Users Conference, National Press Building, Washington, D. C. Important legislative acts have been classified according to subjects, and by states.

COMMON METHODS of Measuring Water as Practiced in Western States is the title of a 50-page pamphlet issued by the Nevada State Engineer's office, Carson City, Nev. Included are much valuable data on units of measurement, methods of measuring flow in streams and flumes, weir and orifice formulas, the construction of simple measuring devices, gaging stations, etc. A large number of discharge and conversion tables are included to make the booklet of great practical value.

New Engineering Books

PUBLIC WORKS ENGINEERS' YEARBOOK 1941—424 pp. Published by the American Public Works Association, Chicago. Price $3.50.

LESSONS IN ARC WELDING—Second Edition. 176 pp. Published by The Lincoln Electric Co., Cleveland, Ohio. Price 50c., U.S.A.; 75c. elsewhere.

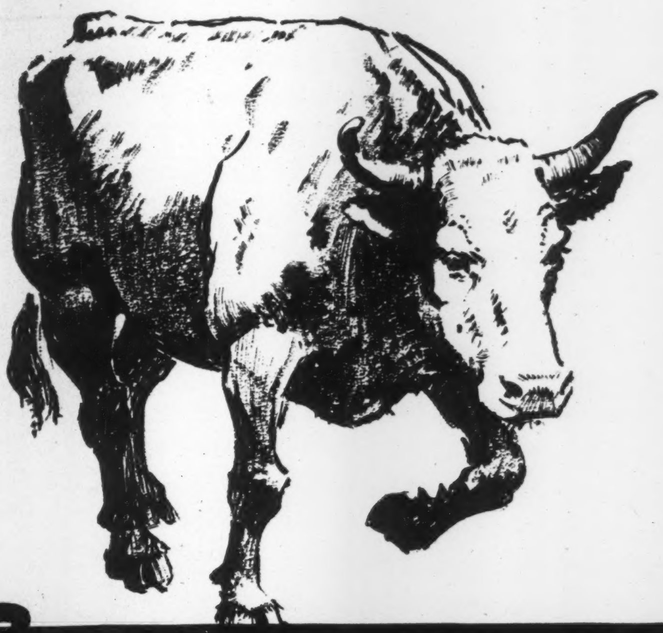
AIR RAID PRECAUTIONS—First American Edition. Reprinted by The Chemical Publishing Co., Inc., Brooklyn, N. Y. Price $3.

AIR RAID DEFENSE (Civilian)—By Curt Wachtel. 240 pp. Published by the Chemical Publishing Co., Brooklyn, N. Y. Price $3.50.

ACCOUNTING FOR ENGINEERS—By John R. Bangs and George R. Hanselman. 532 pp. Published by the International Textbook Co., Scranton, Pa. Price $4.

THE PICKWICK LANDING PROJECT and THE GUNTERSVILLE PROJECT—Published by the Tennessee Valley Authority, Technical Reports 3 and 4. May be obtained from the Supt. of Documents, Washington, D. C. at $1 each.

(*Continued on p.* 75)



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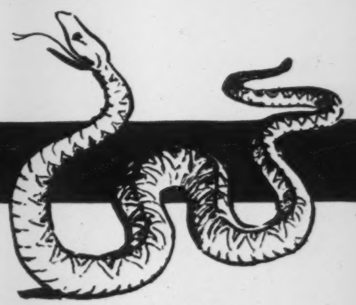
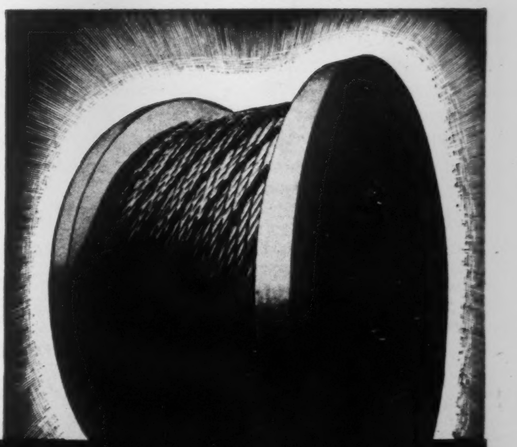


PURPLE STRAND
FORM-SET
WIRE ROPE



Rugged strength and smooth, easy handling get together in Purple Strand Form-set wire rope.

The Purple Strand means that the rope is 100 per cent Improved Plow Steel, the strongest, toughest steel used in making wire rope. The Form-set (preformed) construction means that the rope is easy to handle, won't wicker, spools smoother, is more resistant to bending fatigue.

Next time you buy wire rope for a hard-running job . . . look for the Purple Strand, and then say "Form-set." You'll be getting a combination of strength and ease of handling that's hard to beat.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

CHEMICAL STORAGE BUILDING KANSAS CITY, MO.

OWNER: City of Kansas City, Mo.; Burns & McDonnell, Kansas City, engineers.

PROJECT: Construction of brick and reinforced concrete chemical building to provide space for storage of 200 tons of chemicals in connection with water softening plant in North Kansas City, Mo. Width 43 ft.; length 64 ft.; height 100 ft.

CONDITIONS: Contractor to furnish all material except structural steel and complete work for trial operation in 160 days. Final completion, 220 days. Rail, highway and water transportation available. Prevailing wages are: skilled labor, $1.25 to $1.50 per hr.; semi-skilled, $1.00; and common, 80c.

BIDS: Three bids were received July 1, 1941, ranging from the contract low of $250,000 to $282,000.

LIST OF BIDDERS:

1. S. Patti Constr. Co., Kansas City, Mo. (contract)	$250,000
2. J. M. Jack Constr. Co., Kansas City, Kan.	269,000
3. Carrothers & Crouch Constr. Co., Kansas City, Mo.	282,000

		Unit Prices		
Item	Quan.	(1)	(2)	(3)
1. Foundation piling	9,500 l. f.	$2.70	$2.50	$2.50
2. Piling cutoffs	500 l. f.	2.00	2.50	2.50
3. Class B concrete	375 c. y.	11.00	12.00	25.00
4. Class A concrete	—— c. y.	11.25	15.00	26.00
5. Reinforcing steel	—— lb.	.05	.06	.06

FLOOD PROTECTION ELMIRA, N. Y.

OWNER: U. S. Engineer Office, Binghamton, N. Y.

PROJECT: Construction of flood protection project (Section No. 1) along right bank of Chemung River, within city limits of Elmira, Chemung County, N. Y. Involves construction of levee embankments, construction of new concrete walls, raising of existing walls, and construction and alterations of sewers, culverts, drains and manholes.

CONDITIONS: Contractor to furnish all materials and complete work in 550 days. Railway and highway transportation facilities available. Minimum wage rates specified are: skilled labor, $1.00 to $1.50 per hr.; semi-skilled, 55 to 90c.; and common labor, 50c.

BIDS: Five bids were opened April 29, 1941, ranging from the contract low of $232,669 to $432,691. Engineer's estimate, $232,331.

LIST OF BIDDERS

1. Binghamton Constr. Co., Binghamton, N. Y. (contract)	$232,669
2. Kuchar Brothers, Montvale, N. J	256,956
3. Clevorock, Inc., New York, N. Y	323,959
4. L. B. Strandberg & Son, Chicago, Ill	350,004
5. Spencer & Ross, Inc., Detroit, Mich.	432,691

		Unit Prices		
Item	Quan.	(1)	(2)	(3)
1. Clearing and grubbing	L.S.	$6,500.00	$3,000.00	$12,000.00
2. Stripping, levee foundation	2,500 c. y.	.24	.40	.40
3. Excavation, common	18,000 c. y.	.50	.90	1.00
4. Excavation, borrow area	39,000 c. y.	.30	.40	.40
5. Excavation, rock	50 c. y.	4.00	6.00	5.00
6. Remove walls, slabs, paving, bldg. found. (conc. or masonry)	110 c. y.	2.50	8.00	15.00
7. Sheeting (incl. shoring)	9,200 s. f.	.65	.70	.40
8. Struct. backfill, compacted	5,200 c. y.	1.30	.50	1.00
9. Struct. backfill, uncompacted	700 c. y.	.15	.35	.70
10. Embankment, levee	36,000 c. y.	.12	.20	.20
11. Additional rolling	1,500 sq.	.03	.03	.05
12. Topsoil, placing	2,500 c. y.	.50	.70	1.00
13. Topsoil, furnish and place	300 c. y.	1.10	1.50	1.20
14. Seeding	4.4 ac.	172.00	250.00	250.00
15. Landscape grading	200 sq.	.55	.30	2.00
16. Dumped riprap	2,350 c. y.	4.50	7.00	9.00
17. Rock paving	70 c. y.	8.00	9.00	12.00
18. Gravel, backing and drains	500 c. y.	2.25	3.00	4.00
19. Test and seal exist. conc. surf	5,100 s. f.	.07	.20	.20
20. Class A concrete	3,700 c. y.	23.00	26.00	35.00
21. Class B concrete	100 c. y.	13.00	20.00	33.00
22. Drill holes, conc. or masonry	1,500 l. f.	.40	.70	.75
23. Steel sheet piling, type I	12,500 s. f.	1.20	1.20	1.25
24. Steel sheet piling, type II	23,800 s. f.	1.30	1.35	1.50
25. Steel sheet piling, type III	425 s. f.	1.40	1.50	1.60
26. Steel sheet piling, type IV	6,800 s. f.	.80	1.20	1.25
27. Cutting steel sheet piling or struct. steel	100 l. f.	.50	1.00	1.00
28. Burning holes in st. sheet piling	2,300 ea.	.20	.25	.20
29. Structural steel	47,000 lb.	.15	.06	.08
30. Miscellaneous metalwork	3,500 lb.	.15	.15	.20
31. Copper	1,700 lb.	.60	.50	.70
32. Steel for conc. reinforcing	352,000 lb.	.06	.05	.07
33. Replacing stone masonry	15 c. y.	6.00	15.00	30.00
34. 8-in. drain tile	510 l. f.	.50	.50	.50
35. Cast iron pipe	4,600 lb.	.05	.05	.08
36. 18-in. corr. metal pipe	41 l. f.	5.00	4.00	6.00
37. 8-in. plain concrete pipe	10 l. f.	.60	.50	.75
38. 12-in. plain concrete pipe	10 l. f.	.75	1.00	1.35
39. 15-in. plain concrete pipe	20 l. f.	1.10	2.00	1.80
40. 18-in. plain concrete pipe	50 l. f.	1.50	2.50	2.50
41. 30-in. rein. concrete pipe	85 l. f.	6.00	5.00	6.00
42. 30-in. rein. conc. pipe, ext. str	55 l. f.	6.00	6.00	7.50
43. 8-in. drainage gates	4 ea.	30.00	28.00	30.00
44. 12-in. drainage gates	2 ea.	35.00	30.00	40.00
45. 15-in. drainage gates	1 ea.	45.00	45.00	45.00
46. 18-in. drainage gates	1 ea.	60.00	60.00	70.00
47. 30-in. drainage gates	1 ea.	110.00	100.00	140.00
48. Recondition and reinstall 15-in. gates	1 ea.	30.00	30.00	40.00
49. Wood stop logs	.75 M bm.	100.00	150.00	300.00
50. Temp. road surf., gravel	170 c. y.	4.00	3.00	6.00

HIGHWAY, UTAH

OWNER: Utah State Road Commission, Salt Lake City. E. C. Knowlton, state road engineer.

PROJECT: Construction of concrete and plant mix bituminous surfaced state highway from Draper Cross Roads to Lehi in Salt Lake and Utah Counties. Length of project 3.784 miles; roadway width, 43-ft.

CONDITIONS: Contractor to furnish all materials and complete work in 140 working days. Rail and highway transportation facilities available. Wage rates are: skilled labor, 80c. to $1.10 per hr.; semi-skilled, 65c.; and common, 50c.

BIDS: Six bids were opened May 19, 1941, ranging from the contract low of $162,969 to $176,487. Estimate, $148,090.

LIST OF BIDDERS:

1. W. E. Ryberg Co., Salt Lake City, Utah (contract)	$162,969
2. W. W. Clyde & Co., Springville, Utah	167,823
3. Mullins & Wheeler, Salt Lake City, Utah	168,610
4. Strong & Grant, Springville, Utah	169,892
5. Ora Bundy, Ogden, Utah	173,843
6. Northwestern Engineering Co., Rapid City, S. Dak	176,487

		Unit Prices		
Item	Quan.	(1)	(2)	(3)
1. Concrete pavement	49,000 s. y.	$1.97	$2.20	$2.00
2. Plant-mixed bitum. surf	9,745 ton	1.79	1.75	1.98
3. Bituminous mat'l, Type SC-6	95,600 gal.	.08	.07	.08
4. Bituminous mat'l, Type RC-4	17,870 gal.	.08	.085	.085
5. Bituminous mat'l, Type MC-1	35,540 gal.	.09	.085	.09
6. Cover material	900 ton	2.00	1.60	2.75
7. Cr. rock or cr. gravel surf. crse	32,270 ton	.49	.35	.54
8. Unclassified excavation	10,000 c. y.	.40	.25	.38
9. Overhaul, Class A	52,500 sta. y.	.02	.015	.015
10. Overhaul, Class B	1,450 y. mi.	.15	.20	.15
11. Watering	300 M gal.	1.00	1.50	1.50
12. Rolling	250 hr.	2.58	3.50	2.50
13. 8-in. corr. galv. metal pipe	266 l. f.	1.20	1.10	1.15
14. 12-in. corr. galv. metal pipe	52 l. f.	1.50	1.40	1.40
15. Embankment protectors	5 ea.	17.85	25.00	20.00
16. Structure excavation	175 c. y.	1.50	1.00	1.40
17. Remove existing structures	11,400 s. y.	.49	.50	.50
18. Obliterate old road	0.8 mi.	200.00	200.00	300.00
19. Concrete, Class A	6 c. y.	30.00	25.00	27.50
20. Reinforcing steel	325 lb.	.08	.08	.10
21. Structural steel	300 lb.	.15	.15	.15
22. Guard rail	4,746 l. f.	1.25	1.50	1.27
23. 6-in. underdrains	470 l. f.	.46	.50	.50

New Engineering Books

(*Continued from p.* 72)

ENGINEERING DESCRIPTIVE GEOMETRY AND DRAWING—By Frank W. Bartlett and Theodore W. Johnson. 572 pp. Published by John Wiley & Sons, Inc., New York; Chapman & Hall, Ltd., London. Price $4.50.

RESULTS OF MUNICIPAL ELECTRIC SYSTEMS 1941—Seventh Edition. 425 pp. Published by The Burns & McDonnell Engineering Co., Kansas City, Mo. Price $5.

PRACTICAL SHIP PRODUCTION—By A. W. Carmichael. Second Edition. 283 pp. Published by McGraw-Hill Book Co., Inc., New York and London. Price $3.

HIGHWAY RESEARCH BOARD—Proceedings of the Twentieth Annual Meeting, Washington, D. C., 1940. 883 pp. Price $3.25.

THE ENGINEERING INDEX-1940—Published by Engineering Index, Inc., 33 W. 29th St., New York, N. Y. Price $50.

Reports and Pamphlets

OHIO CONFERENCE ON WATER PURIFICATION—20th Annual Report. Published by the Ohio Conference on Water Purification, Columbus, Ohio.

NEW YORK, DIVISION OF WATER POWER AND CONTROL—14th Annual Report. Prepared by the Conservation Dept., Albany, New York.

SUMMARY OF TRAFFIC ACCIDENTS (OHIO)—State Highways Outside Municipalities. 1941 edition. Prepared by the Ohio Dept. of Highways; Division of Traffic and Safety, Columbus, Ohio.

AN ANNOTATED BIBLIOGRAPHY OF FISHWAYS—By Paul Nemenyi. Bulletin 23, State University of Iowa. Obtainable from the Dept. of Publications, Iowa City, Iowa. Price 50c.

BOND BETWEEN CONCRETE AND STEEL—Bulletin 147. Iowa Engineering Experiment Station, Ames, Iowa. Limited free distribution.

A COMBINATION SUSPENDED-LOAD SAMPLER AND VELOCITY METER FOR SMALL STREAMS—Circular No. 599. Published by the U. S. Dept. of Agriculture, Washington, D. C.

TIMBER—CONCRETE COMPOSITE DECKS—Published by the Service Bureau, American Wood-Preservers' Association, Chicago, Ill.

MISSOURI—Twelfth Biennial Report of the State Highway Commission. 1940.

4
CYCLE
BRIGGS & STRATTON
GASOLINE
MOTORS
SPRAYERS—
ROAD EQUIPMENT—
MILK COOLERS
THESE ARE BUT A FEW OF THE WIDE RANGE OF APPLICATIONS OF BRIGGS & STRATTON MOTORS
Engineers . . .

Who Design Appliances, Tools and Machines Invariably Write Briggs & Stratton Motors Into Their Gasoline Power Specifications

Designing engineers are always exacting about gasoline power — always want the most in performance, working horsepower, wide power range, durability, strength, economy and other factors. They want the best.

That's why engineers specify Briggs & Stratton air-cooled gasoline motors. There is a wide line of models and types (3/4 to 6 HP) to choose from.

BRIGGS & STRATTON CORP., *Milwaukee, Wisconsin, U. S. A*

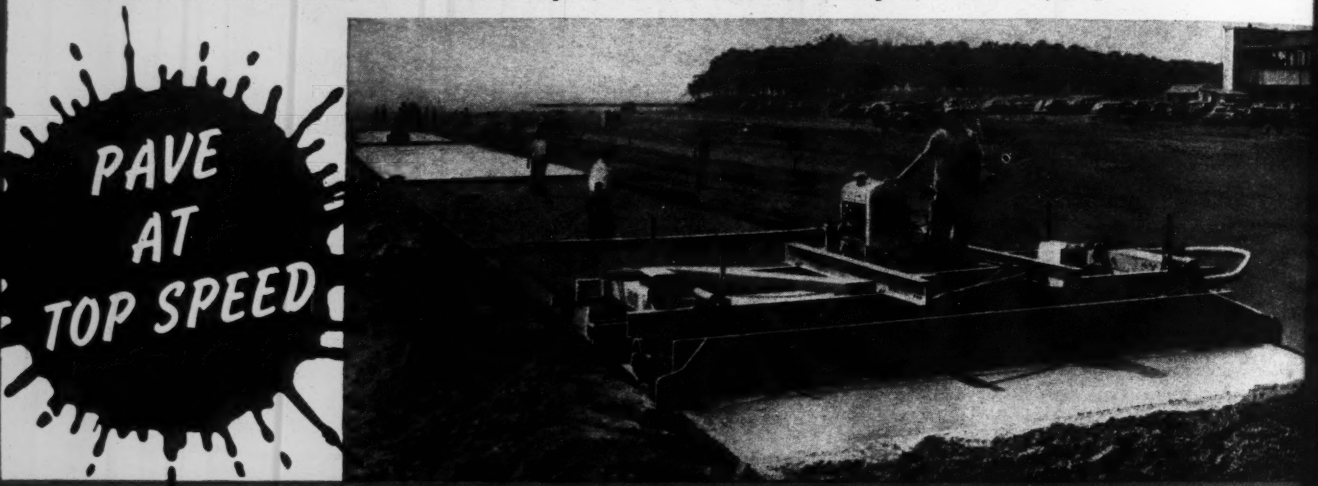
Mighty Good News!

For Builders of Airports and Roads

Contractors will now be able to utilize the maximum production of their biggest pavers. With the new MODEL XB BLAW-KNOX FINISHING MACHINE it is now possible to pave at top speed—with superior quality finish of slab.

This new model finishing machine has greater flexibility of design and operation to handle low slump concrete and better meet variable field conditions.

GOOD NEWS INDEED for defense contractors who must pave in a hurry. New Blaw-Knox Finishing Machines and Concrete Spreaders are hard at work on various defense projects, a few of which are: the Boise (Idaho) Airport; Wendover Airport (Utah); Gunter Field (Ala.); Jefferson Proving Ground (Ind.); Glenn L. Martin Aircraft Plant (Md.); Yakutat Airport (Alaska); Sunset Airport (Wash.); Trans-Isthmian Highway (Panama); Kingsbury Ordnance Plant (Ind.); Vultee Aircraft Plant (Tenn.); Naval Air Base (Fla.); Mobile (Ala.) Airport; Hamilton Field (Cal.) Airport; Scott Field, (Ill.)



USE THE BLAW-KNOX TRANSVERSE BLADE CONCRETE SPREADE
WITH THE NEW MODEL XB FINISHER FOR MAXIMUM YARDAGE AT LOWEST COS

Paving contractors like BLAW-KNOX AUTOMATIC TRANSVERSE BLADE CONCRETE SPREADERS. That's why four times as many Blaw-Knox Spreaders have been sold as all other makes combined, since they were introduced and put into service early last year.

SPREAD CONCRETE MECHANICALLY: — Blaw-Knox CONCRETE SPREADERS, equipped with an automatic transverse spreading blade, easily handle the top output of any paver . . . will spread concrete without segregation . . . will spread concrete as dry as ½ inch slump . . . will spread concrete without disturbing road form alignment . .

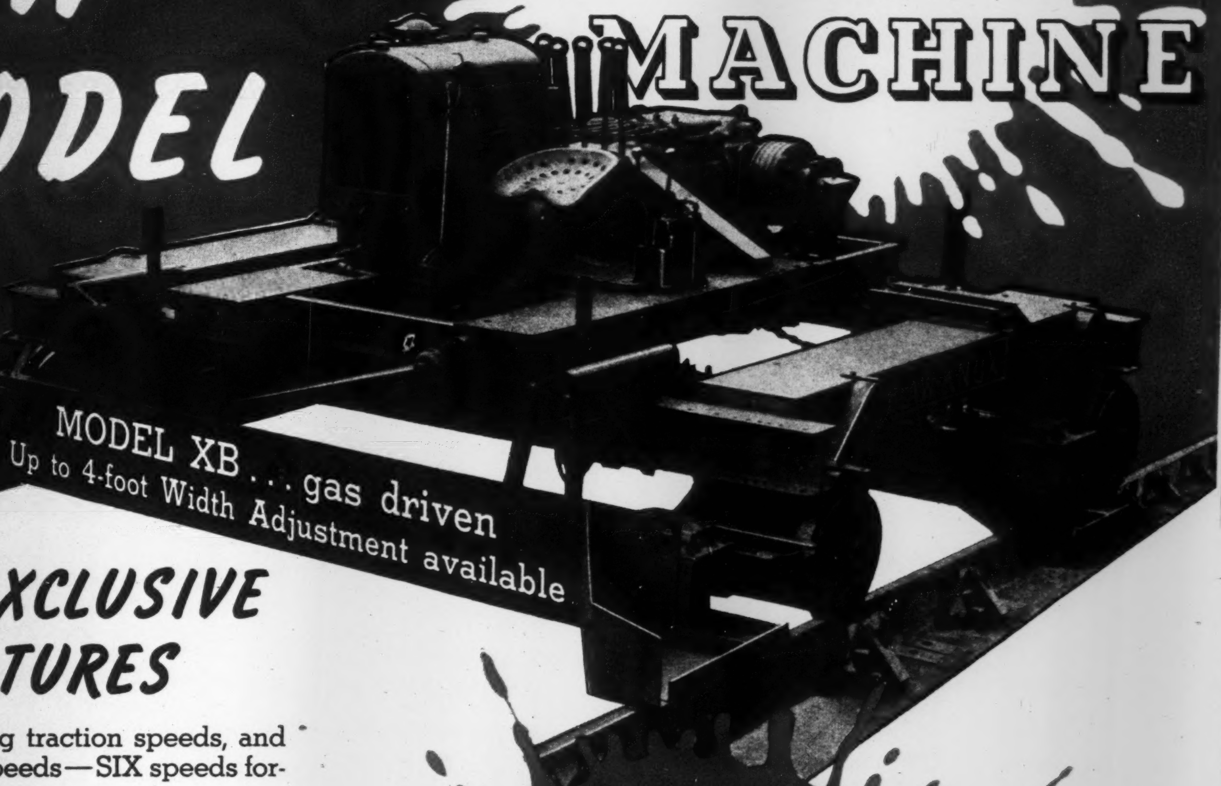
Dump concrete anywhere on the subgrade and the spreader does the rest — the spreading blade action is automatic.

Blaw-Knox Concrete Spreaders can be changed from narrow (single lane) to full width or vice versa by purchase of change parts. This cannot be done with any other concrete spreader.

BLAW-KNOX

..THE NEW MODEL

Blaw-Knox FINISHING MACHINE



MODEL XB . . . gas driven
Up to 4-foot Width Adjustment available

HAS EXCLUSIVE FEATURES

- FOUR working traction speeds, and TWO travel speeds—SIX speeds forward and reverse.
- FOUR screed speeds.
- UNIT AUTOMOTIVE TRANSMISSION drives traction, screeds belter, and tamper or vibrator.
- SPECIAL WHEEL EQUIPMENT for multiple lane construction of airport runways and aprons.
- REMOVABLE WHEEL RIMS for quick wheel change.
- STRONGEST structural frame of any finishing machine ever built. One piece cross members—no splices. Design provides better weight distribution with elimination of 1000 lbs. excess weight—easier on the forms.
- WIDEST screed ends—keeps concrete between forms.
- FOOT PEDAL STEERING and braking.

5 YEAR GUARANTEE

ON
STRUCTURAL FRAMES
AND
WHEEL AXLES

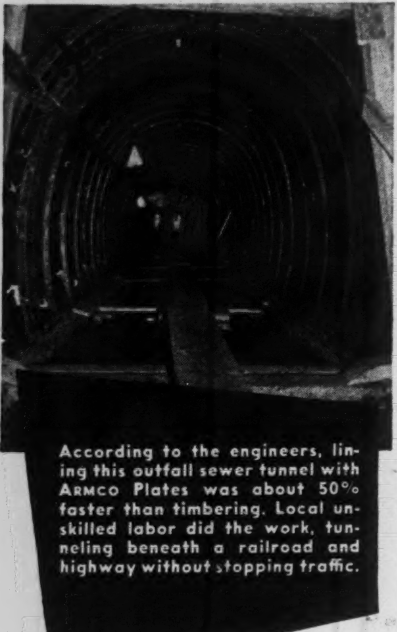
Other features of the new
MODEL XB BLAW-KNOX FINISHING MACHINE
include:

—Self-aligning ball bearings for screed drive.
—Accurate quick adjustable front screed for rapid crown change.
—Fast power operated hydraulic screed lift.
—Efficient wheel cleaners.
—Quick and convenient transportation wheels.

BLAW-KNOX DIVISION of Blaw-Knox Co.

Farmers Bank Building Pittsburgh, Pa.
New York Chicago Philadelphia Birmingham
Representatives in Principal Cities

DIG AT TOP SPEED...
These Plates Keep Up!



According to the engineers, lining this outfall sewer tunnel with ARMCO Plates was about 50% faster than timbering. Local unskilled labor did the work, tunneling beneath a railroad and highway without stopping traffic.

• Fast tunneling is no trick with ARMCO Liner Plates. Even inexperienced crews can install them quickly and economically. One man easily handles the strong, light weight metal sections, bolting them together with ordinary wrenches. Work moves fast and costs are low.

On a strength-weight basis ARMCO Plates cost less than any four-flanged type. In many cases you actually buy fewer ARMCO plates because their great strength permits the use of alternate rings in partially self-supporting ground. You'll save even more by ordering ARMCO Plates to fit the job. There's a type and gage to meet every condition. Excess weight is out.

Try ARMCO Liner Plates on your next tunnel. Other contractors and engineers find them a big help in "holing through" ahead of schedule and under the estimate. Write for prices and complete facts. ARMCO DRAINAGE PRODUCTS ASSOCIATION, 505 Curtis Street, Middletown, Ohio.

ARMCO
TUNNEL LINER PLATES

MEN AND JOBS

William Lamson, construction engineer with the board of water supply of the city of New York, retired June 30 after 34 years' experience with that city and the board of water supply. Mr. Lamson graduated from Columbian University, Washington, D. C., with the degree of civil engineer in 1897. He received a C.E. degree in 1899 and a doctor's degree in 1903 from the same school. He was with the U. S. Navy for a decade prior to joining the New York board of water supply Sept. 23, 1907, as assistant engineer. During the World War he served as major of the 316th engineers.

Pennsylvania's department of highways has announced the following appointments to its engineering staff: **William M. Atkins,** of Bedford, district plans engineer for District No. 5 at Allentown; **Edward W. Harry,** of Connellsville, project engineer, District No. 12 at Uniontown.

Capt. Edward G. Herb, of the U. S. Engineers, has been assigned to duty as area officer in charge of the Norfolk dam and reservoir under construction at Norfolk, Ark.

Stanley L. Baker, former city engineer of Newton, Iowa, and recently an engineer of the Iowa conservation commission, has received a civil service appointment with the army engineers. He has gone to Seattle, Wash., to be an assistant engineer in airbase construction.

Robert Wallace has been employed as Buchanan County, Iowa, engineer to replace **Ross Durfee,** who resigned May 1.

Garnet Spring, former building contractor of Rochester, Minn., has been named building inspector of that city.

M. S. Witherington, WPA superintendent in Surry County, N. C., **George E. McKinney,** WPA resident engineer, and **Spencer C. Marshall,** WPA superintendent, are supervising the construction of a million-gallon water purification plant at Elkin, N. C.

Sanford B. Fitts, construction supervisor of the NYA area office at Asheville, N. C., has just been made area shop supervisor.

Graydon Stewart has been appointed superintendent of the municipal water system in Perry, N. Y., succeeding **Fred G. Benedict.**

Earl Watkins, Licking County (Ohio) engineer from 1929 to 1932, has been appointed county engineer by the county commissioners, to succeed Thomas W. Phillips, who died recently after having served only three months in office.

Melvin Holt, for twelve years deputy Benton County engineer at Prosser, Wash., has resigned to accept a position in connection with construction of a government ammunition depot near Hermiston, Ore.

A. H. Kennedy, WPA district manager at Albemarle, N. C., was appointed June 25 as WPA district manager at Durham, N. C., to succeed **James A. McGeady,** who resigned June 21, to accept an engineering position with the Federal Housing Authority on defense housing projects at Wilmington, N. C. Mr. Kennedy is a graduate of Georgia Tech, with a degree in civil engineering, and has been with the WPA since the program began in North Carolina.

Maj. Grover C. Heldenfels, Fort Bliss, Tex., who has been constructing quartermaster at Camp Claiborne, La., has been designated constructing quartermaster at the TNT manufacturing plant to be built at Chattanooga, Tenn.

Col. Schenk H. Griffin, assistant to the district engineer at Washington, D. C., has been assigned by the War Department to duty as district engineer at Duluth, Minn. He succeeds **Maj. Theodore M. Osborne,** who has been made assistant to the district engineer at Tulsa, Okla.

Henry G. Kuitu has been appointed Minnesota field engineer of the Structural Clay Products Institute. Mr. Kuitu was formerly WPA engineer at Virginia, Minn. He succeeds **M. H. Allen,** who has returned to Ames, Iowa, as regional director of the institute.

M. W. Carley has been named acting county surveyor of Ramsey County, Minn., during the absence of **Harry S. Bronson,** who has been called to active duty as major in the coast artillery.

Leonard G. Howell, for the past 11 years city manager of Ironton, Ohio, has been named as the first city manager of Port Huron, Mich. The city manager form of government was adopted by Port Huron at an election this spring.

George F. Foster, supervisor for the Benton County, Ark., WPA project, has resigned to accept a position with the Arkansas state highway department as engineer. **Roy Williamson** of Fort Smith is in temporary charge of the Bentonville WPA office.

Frank T. Miller, Greensboro, N. C., consulting engineer, is conducting a survey on the proposed relocation of main line railroad tracks through Raleigh, N. C., in connection with the construction of a new union depot at Raleigh. For 15 years, Mr. Miller was connected with the engineering department of the Southern Railway.

O. C. Helseth, city engineer at Crookston, Minn., has gone to Fort Snelling, Minn., for a year's service in the engineering division of the army. He holds a first lieutenant's commission in the reserve corps.

Lt. Col. Emory J. Close, recently transferred to Charleston, S. C., from Fort Belvoir, Va., has assumed his duties in the office of **Lt. Col. Reading Wilkinson,** U. S. district engineer for the Charleston district. Col. Close, who was assistant constructing quartermaster at Fort Belvoir, will be in charge of air corps construction work in the Charleston district, a post held by Col. Wilkinson prior to the recent retirement of **Col. William B. Ladue,** who was temporarily called back to active duty.

A. A. Siler of Sylva, N. C., district engineer for the North Carolina Highway and Public Works Commission, has been named assistant western division engineer to succeed **S. C. Austin,** who has been appointed equipment engineer for the commission. **John C. Walker** is western division engineer. Mr. Siler has been connected with the commission for about fifteen years.

Ralph Craig, bridge designer for the South Dakota state highway commission, has resigned to accept a position with Hassenstein Steel Co. at Sioux Falls, S. D. Mr. Craig has been with the state highway commission since 1935.

Don Schliessmann, graduate civil engineer from the University of Illinois, has accepted a position with the materials testing laboratory, Illinois Highway Department, and will be stationed at East St. Louis.

Raymond F. Burt, a civil engineer, has been named to the position of building inspector at Madison, Wisconsin. The appointment was made by Gordon E. Nelson, city building commissioner.

Charles B. Bennett, planning engineering for the city of Milwaukee since 1926, has resigned to accept the position of executive director of the newly created area planning commission at Harrisburg, Pa. He has been consultant and advisor for the American Society of Planning for the last two years and it was on one of his tours for that organization that he

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PUMP
Serves Oldest Incorporated Town in Washington

FOR years the lower section of Steilacoom, Washington, received its water by gravity from springs, while the hill district was supplied by repumping from the reservoir to a tank on a hill.

By 1939 increased demand had made expansion necessary. So a 10″, 140′ well was drilled on the hill near the tank. A 10″, 5-stage Fairbanks-Morse Turbine Pump driven by a 30-hp. F-M Motor was set in the well at about 100′. Starting and stopping are automatic, controlled from the tank by a float switch. Should need arise, the new hill system can serve the lower district, too.

Your pumping conditions may call for entirely different solution. But you'll find highly efficient pumps of the right type and capacity in the *complete* Fairbanks-Morse line. And from F-M you'll get the conscientious counsel of a fully informed representative—counsel that makes for successful, economical installations.

Write Fairbanks, Morse & Co., Dept. G29, 600 S. Michigan Ave., Chicago. Branches and service stations throughout the United States and Canada.

Inside the Steilacoom pump house—a 10″ Fairbanks-Morse Turbine Pump driven by a 30-hp. F-M Motor. Below—pump house and water tank.

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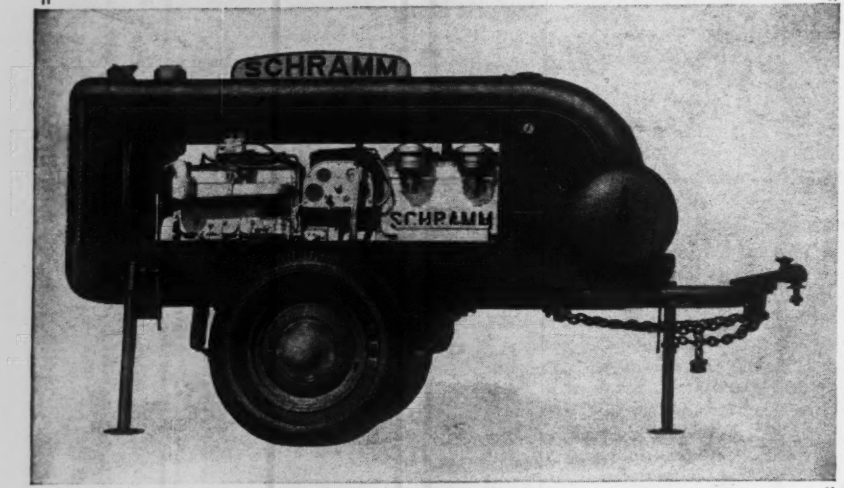
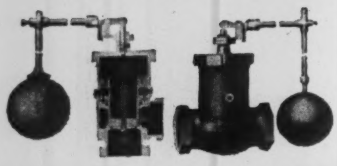


SCHRAMM STANDARD 105 CUBIC FOOT AIR COMPRESSOR
SCHRAMM, INC.
WEST CHESTER, PA.
DEALERS IN PRINCIPAL CITIES

See pages 56 and 57 of our new 96-page catalog for information on these
STANDARD COLD WATER FLOAT VALVES



Furnished in sizes ½" to 2" bronze, screwed ends, these Float Valves are recommended for cold water service where minimum inlet pressure is not less than 10 pounds per square inch.

Valves may be arranged with remote pilot control valve in lieu of integral lid pilot valve as shown; also, to function on differential water levels—that is, to close at desired full-tank level, but not re-open against influent pressure until the tank level lowers to a predetermined depth.

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VALVE SPECIALTY CO.
Fulton Building Pittsburgh, Pa.

Handle materials at long ranges profitably!

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STONE
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Combine three jobs (digging, hauling and placing) into one economical operation.

A SAUERMAN Scraper penetrates hard materials with the ease of a plow-share, and both in digging and conveying it requires much less line-pull than any other scraper of equal rated capacity. It digs a heaping load in a few seconds, moves this load rapidly over the ground, dumps cleanly when it reaches the dumping point and then returns at high speed for another load.

For full details of SAUERMAN Scrapers, handling capacities, methods of operation, etc., etc., write for Bulletin 147.

SAUERMAN BROS. INC.
432 S. Clinton St., Chicago

Small Sauerman Scraper strips overburden from ore deposit at rate of 60 cu. yd. per hour, placing the spoil in a high pile.

interested a group of wealthy Harrisburg citizens to initiate the planning set-up. Mr. Bennett will surrender pension rights of 23 years. He was assistant city planner for several years before succeeding the late Gardner Rogers at Milwaukee.

Maj. Harry S. Bronson, who has been in the control section of the zone office, Omaha, Neb., has been named constructing quartermaster for the $8,000,000 Maumelle Ordnance Works, located near Marche, Ark.

John W. Hart, assistant city engineer at Hot Springs, Ark., has resigned to accept the position of office manager for the Plum Bayou Resettlement Administration's farm rehabilitation project.

The following officers of the Civil Engineer Corps, U. S. Naval Reserve, have been called to active duty:

Lt. Comdr. Horace B. Compton, assistant professor of civil engineering, Rensselaer Polytechnic Institute, Troy, N. Y., to active duty in the 14th Naval District, Pearl Harbor, T. H.

Lt. Comdr. Elmer B. Greey, vice-president, Matthews Construction Co., Inc., Princeton, N. J., to active duty in the 14th Naval District, Pearl Harbor, T. H.

Lt. Comdr. Howard H. Houk, principal engineer, Interdepartmental Engineering Commission, CAA, Washington, D. C., to active duty in the Bureau of Yards and Docks, Washington, D. C.

Lt. Comdr. Marion X. Wilberding, president, Wilberding Co., Inc., Washington, D. C., to active duty in the Bureau of Yards and Docks, Washington, D. C.

Lt. Robert W. Abbett, assistant professor of civil engineering, Columbia University, New York, N. Y., to active duty in the Bureau of Yards and Docks, Washington, D. C.

Lt. Arden A. Ewald, associate structural engineer, dams division, TVA, Knoxville, Tenn., to active duty in the Bureau of Yards and Docks, Washington, D. C.

Lt. Charles K. Weidner, assistant superintendent of buildings and grounds, University of Washington, Seattle, Wash., to active duty at the Naval Air Station, Pensacola, Fla.

Lt. Lawrence F. Adams, assistant engineer, designer, Board of Water Supply, New York, N. Y., to active duty in the Bureau of Yards and Docks, Washington, D. C.

Lt. Thomas W. Anderson, of the firm of Henrikson-Alstron-Anderson, of Seattle, Wash., to active duty at the Naval Air Station, Jacksonville, Fla.

Lt. Angelo F. Ghiglione, assistant superintendent, Alaska Road Commission, Anchorage, Alaska, to active duty in the 13th Naval District, Seattle, Wash.

Lt. Victor M. Hoar, assistant engineer, Federal Power Commission, Washington, D. C., to active duty at the Marine Barracks, Parris Island, S. C.

Ensign Dennis K. Culp, sanitary engineer, County-City Health Dept., Wenatchee, Wash., to active duty at the Puget Sound Navy Yard, Bremerton, Wash.

Ensign Harold A. Hoglin, junior engineer, U. S. Bureau of Reclamation, Denver, Colo., to active duty in the Bureau of Yards and Docks, Washington, D. C.

Ensign Russell B. Neal, safety engineer, Marsh & McLennan, Inc., Chicago, Ill., to active duty at the Naval Training Station, Great Lakes, Ill.

Ensign William R. Peters, assistant engineer, State Railroad Commission, San Francisco, Calif., to active duty at the Navy Yard, Mare Island, Calif.

Glen Doty of Charles City, Iowa, has been promoted to the position of assistant district engineer at Mason City by the Iowa State Highway Commission.

C. W. Hiner has been appointed Nebraska district engineer for the Portland Cement Association and will be located at 514 South 18 St., Omaha. He succeeds **H. J. Young,** who has resigned.

Clark LaBarre has been named acting Skamania County engineer at Goldendale, Wash., to succeed **H. Seymour Hall.**

Joseph C. Harrison, WPA engineer, who has been supervising the street paving project at Mena, Ark., the past two years, has been assigned by WPA to Waldron to supervise the engineering work on the new waterworks project. **Homer Evans** of Mena will take over the supervision of the Mena project.

Capt. Earl K. Haag, Long Beach, Miss., construction quartermaster at LaGarde General Hospital, New Orleans, La., has been assigned as construction quartermaster at the $29,000,000 Minden, La., shell loading plant.

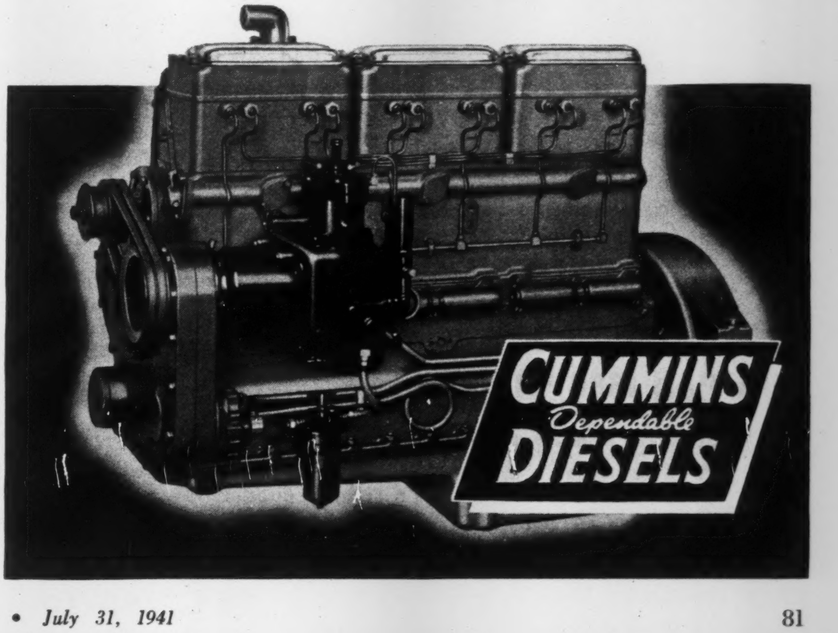
H. B. Howe is now an engineering draftsman with the Canada Cement Company, Montreal East, Que. He is a bachelor of science degree from Queens University.

Jacques Racicot is now resident engineer with the Quebec Roads Department, Montreal, Que. He is a graduate in civil engineering from the Ecole Polytechnique, Montreal.

GETTING BY... OR GETTING AHEAD?

With the National Defense program creating plenty of construction jobs, it's easy right now to just *get by* . . . stick to present equipment and present methods . . . regardless of age or efficiency. But there's no future in it because the contractor with the out-of-date machinery and the outmoded methods will be lost in tomorrow's highly competitive scramble for jobs. That's why the contractors who are intent on *getting ahead* and *staying there* are constantly improving and modernizing their operations . . . both machines and methods. That's why contractors with an eye on the future are standardizing on Cummins Diesel power . . . the power that has demonstrated its superior economy, dependability and flexibility in all types of heavy-duty material handling equipment. Cummins Engine Company, 3616 Wilson Street, Columbus, Indiana.

ILLUSTRATED: *Model HB1-600 Cummins Dependable Diesel. 150 hp. at 1800 rpm. Other models from 33 hp. to 325 hp.*



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No. 200 for pulling the less difficult piles; No. 400 for pulling the commonly used sizes and lengths of steel sheet piles driven under average conditions and also for pulling the smaller sizes of wood piles; No. 800 for pulling the heaviest, longest, and most difficult steel piles and also for pulling all sizes and lengths of wood, concrete, H-beam, or pipe piles.

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MEETINGS

Photoelasticity, Summer Short Course, Massachusetts Institute of Technology, Cambridge, Mass., July 28-Aug. 8.

National Institute for Traffic Safety Training, 4th annual, University of California, Berkeley, Calif., Aug. 4-16.

Aircraft Structures Conference, sponsored by Civil Engineering Division, Society for the Promotion of Engineering Education, New York University, New York, N. Y., Sept. 5-6.

Pan-American Highway Congress, fourth exposition, National Stadium, Mexico City, D. F., Sept. 15-24.

REGIONAL AND LOCAL MEETINGS

New York State County Highway Superintendents Association, 30th annual summer meeting, Hotel Syracuse, Syracuse, N. Y., Aug. 6-7.

Western Pennsylvania Section, American Water Works Association, annual convention, Erie, Pa., Aug. 7-9.

Illinois Road Builders Association, second annual Round-Up, Elgin Country Club, Elgin, Ill., Aug. 12.

Pennsylvania Sewage Works Association, State College, Pa., Sept. 3-5.

Northern Michigan County Road Commissioners Association, annual meeting, Cheboygan, Mich., Sept. 18-19.

New York State Association of Town Highway Superintendents, Rochester, N. Y., Sept. 18-20.

New England Water Works Association, Hotel Statler, Boston, Mass., week of Sept. 23-26.

ELECTIONS AND ACTIVITIES

The Association of Southeastern State Highway Officials was officially organized on July 2, when highway engineers and directors from the states of Mississippi, Virginia, Tennessee, Alabama, and North and South Carolina met at Montgomery, Ala. The object of the organization is said to be "to avoid costly trial and error methods", and to provide road officials with a medium through which to exchange ideas and experiences on problems of engineering, soil, climatic and other conditions concerned with roadbuilding. Highway officials from Georgia, West Virginia, and Kentucky have been invited to join the regional organization. At this meeting, W. Vance Baise, state highway engineer of South Carolina, was elected president; Chris J. Sherlock, Alabama highway director, vice president; B. W. Davis, maintenance and equipment engineer of North Carolina, secretary-treasurer.

Grady S. Harrell of Shannon, N. C., has been appointed by Governor Broughton to the North Carolina state board of registration for engineers and land surveyors. Mr. Harrell was recently elected president of the North Carolina Society of Surveyors.

George W. Koronski, Gogebic County, Mich., engineer, has been elected president of the Upper Peninsula Road Builders Association. He succeeds E. J. Pearce of Menominee. W. V. Veale, of Ahmeek, was named vice president; T. S. Dundon, of Newberry, secretary-treasurer.

Walter M. Cederstrand, Minneapolis general contractor, has been named acting president of the Associated General Contractors of Minnesota, to serve during the absence of President O. W. Swanson, of St. Paul. Mr. Swanson has been called to Newfoundland where he will take over certain phases of the construction work at the new U. S. base there. Mr. Cederstrand has been serving as first vice president of the contractors association.

Leon Small, water engineer of the Baltimore department of public works, was recently elected to the presidency of the Baltimore Engineers Club.

For Meritorious Achievement in improving waterworks service, George Riddell Spalding of Oradell, N. J., sanitary engineer of the Hackensack Water Co., has received the George W. Fuller Memorial Award of the American Water Works Association. Mr. Spalding conducted the research which resulted in the successful application of powdered activated carbon, in controlling taste and odors in water by a procedure now adopted by several thousand water companies for routine water treatment.

Organization of the Utah post of the Society of American Military Engineers was completed July 18 at a meeting of 50 leading army and civilian engineers of the state. W. E. Swanson was elected president of the organization. Other officers elected were: H. A. Johnson, first vice president; Victor D. Wheeler, second vice president; Charles E. Fry, secretary; J. N. Bonnemort, treasurer; C. F. Berghout, assistant treasurer. The following were made directors: Capt. Thomas H. Messer, Capt. B. Carl Bluhm and Wesley R. Budd.

At a Recent Meeting of the South Carolina State Board of Engineering Examiners the following officers were reelected for the ensuing year: L. S. LeTellier, chairman; George R. Morgan, vice chairman, and T. Keith Legare, secretary. The board appointed chairman LeTellier and secretary Legare as official delegates of the board to the annual meeting of the National Council of State Boards of Engineering Examiners, which is to be held in New York City, Oct. 27-30.

POZZOLITH increased the workability of "Pump-crete", made placeability easier, on this giant filtration plant of the City of Milwaukee.

HIS JOB MOVED FASTER *because*—

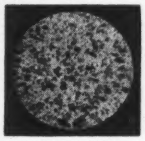
CEMENT DISPERSION

PUT ALL THE CEMENT TO WORK

HOW POZZOLITH WORKS

UNDISPERSED

Pozzolith contains Master Builders' cement dispersing agent. Cement particles in their normal state in water tend to gather together in bunches; i.e., flocculate. This bunching entraps water within the particle clumps. See microphotograph at left.



DISPERSED

With Master Builders' dispersing agent these bunches are broken up into individual cement particles distributed throughout the water; i.e., dispersed or deflocculated. See microphotograph at right.

This dispersion makes the cement usable to its full efficiency; all the cement surface is made available for hydration and all the water for lubrication of the mix. (Water held within the particle clumps is released.)

FIVE ADVANTAGES

As a result of adding Pozzolith to cement mixes there occur these five advantages:—

1. **Durability increased 50% or more.**
2. **High Early Strength — 20% or more increase in compressive strength at all ages.**
3. **Water reduction, up to 20% — slump increased 150% or more for given water ratio.**
4. **Increased water-tightness — 20% or more reduction in absorption and permeability.**
5. **Reduced bleeding and segregation.**

CEMENT DISPERSION WITH POZZOLITH PRODUCES BETTER CONCRETE WITH EASIER PLACEABILITY—SPEEDS UP THE JOB—SAVES TIME AND MONEY

Cement Dispersion with POZZOLITH speeds up the job,— but adds no increased over-all cost,— in many cases substantial savings are made. Concrete with Pozzolith contains less water yet flows faster through the maze of reinforcing steel into all parts of the forms.

OUTSTANDING TECHNOLOGIC ACHIEVEMENT

Authorities have long known that dispersion of cement particles would greatly increase the efficiency of the cement and augment its durability. Discovery by Master Builders Research Laboratories of a practicable cement dispersing agent and its application to all types of hydraulic cement through POZZOLITH has proved to be an outstanding technologic achievement. The past decade, devoted to introducing POZZOLITH and proving its value in actual construction to engineers, contractors and owners, has firmly established its validity and made its acceptance general.

WIDELY USED

The wide use of POZZOLITH today is a natural consequence of this ten year record of successful performance. Hundreds of thousands of cubic yards of better concrete on private projects, as well as huge defense works, are being placed more quickly, and more easily through the cement-dispersing quality of POZZOLITH.

SPEED AND ECONOMY

Important to all engineers, contractors and owners is the fact that POZZOLITH produces 5 vital advantages, as listed at left, speeds up the job at no increased over-all cost, and in many cases at substantial savings.

The complete story of Cement Dispersion and POZZOLITH will be sent on request.

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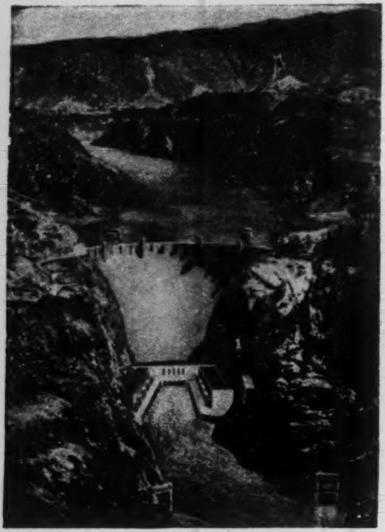

Bailey Meters AT BOULDER DAM

● In Boulder Dam Power Plant as in many other new hydro-electric stations including Madden Dam and Norris Dam, Bailey Fluid Meters are installed on hydraulic turbines.

At Boulder Canyon, the Bailey Meters measure water supply through 13 foot diameter penstocks under an average head of 530 feet. These meters indicate and record the water flow in terms of cubic feet per second and continuously integrate in millions of cubic feet. The registers are operated by pressure connections in the turbine scroll casings.

While your project probably does not entail the volume and head of water that is being measured at Boulder Canyon, it is nevertheless, important that your measurements of flow and liquid level be accurately made by reliable equipment.

Write for complete information on the application of Bailey Meters to your problem. MU-19

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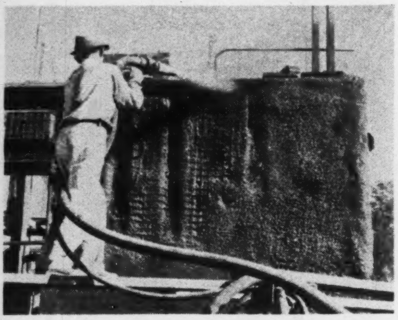
New Aids to the Constructor

Equipment and material announcements and manufacturers' news



Pneumatic Concrete Gun

A new "Gun" for placing high test concrete by compressed air is being manufactured and used in Southern California, and is known as the "Westberg Cement Pressure Gun." The gun will deliver as high as 10 cubic yards of material per hour. This gun operates automatically on a rotary valve principle that conveys pre-mixed dry materials into a high pressure stream of air passing thru the gun. Compressed air enters the gun thru a screw operating in the air chamber below the rotor valve, and thru an air dome placed between the screw and rotor valve. Materials are fed into the gun by hand shoveling or by a conveyor synchronized with the speed of the rotor valve. The pre-mixed materials are thus conveyed pneumatically out of the gun thru a rubber lined hose to a nozzle at the end of the hose, then blown into position on the wall or other parts of construction work on which it is being used. Water is introduced into the nozzle under 100 pounds pressure which hydrates the dry materials causing them to stick in position and develop the full strength of the cement. Concrete placed with this gun develops compressive strengths of 4000 to 6000 pounds per square inch, determined by the proportion of cement used.—*Cosco Manufacturing Company, 832 East 60th Street, Los Angeles.*

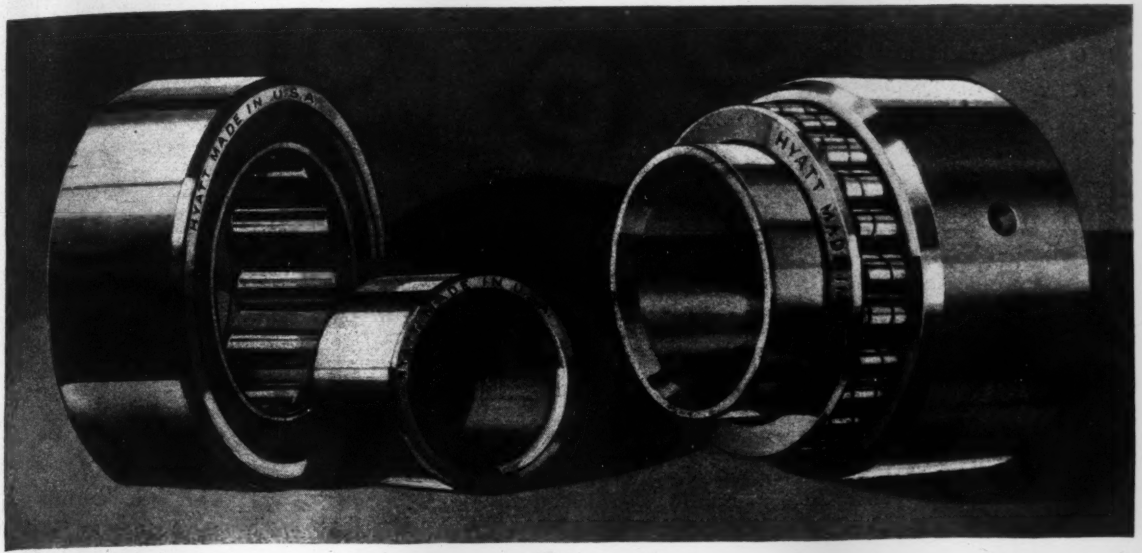
Treatment for Diesel Cooling Systems

A new, non-injurious, strictly organic water treatment for circulatory cooling systems in diesel engines consists of only a single liquid addition to the cooling

Highway Tunnel Cleaning Machine

For cleaning the 500,000 sq.ft. of glass tile in the New York City Midtown Tunnel a mechanized combination washing-and-spraying machine was developed. The tank holds 750 gal. of soap solution in one compartment and 1750 gal. of clean water in another. In addition to the propulsion power supplied by a Mack Thermodyne engine, two auxiliary gasoline engines are used in the operation of the washer, one for a pump for the soap mixer and clean water spray, and the other for an air compressor which drives scrubbing and cleaning brushes. With this machine it is possible to clean the ceiling as well as the walls. In washing, the soap solution is sprayed on the walls, the air-motor-driven brushes with water attachments scrub the tile surface followed by high pressure rinsing clean-water sprays. To keep the brushes on the wall surface and permit deviation from a line parallel to the wall, the brushwheel assemblies and wall guide wheels are mounted on a moving frame held in the working position by means of balancing weights.—*Mack Trucks, Inc., 34th St. and 48th Ave., Long Island City, N. Y.*

KEEP THEM YOUNG WITH HYATTS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THEIR QUALITY MANUFACTURE ASSURES THEIR DEPENDABLE OPERATION

YOU ARE MORE INTERESTED in how Hyatt Roller Bearings perform than in the way they are built. Yet, the two go hand in hand. That's why we like to have you know how well we design and manufacture them and let their record of dependable performance tell the rest of the story.

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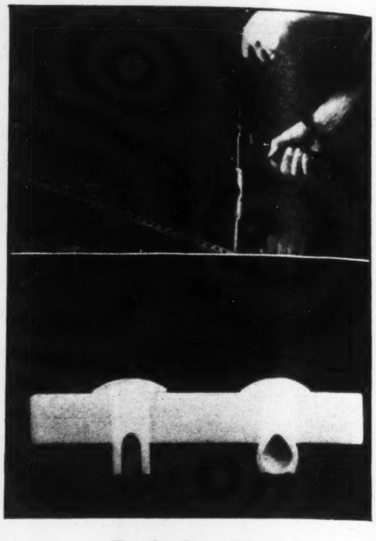
QUIET

ON THE JOBS America Has To Do *today and tomorrow*

TO CONTINENTAL Motors Corporation, the term "national defense" embraces all the power jobs America has before it. None is more important than building Red Seal Engines for leading manufacturers of farm tractors, combines and machinery. Other equally important jobs are adapting Red Seal Power for the highways to be laid, buildings, bridges and dams to be erected, oil to be pumped, the speeding of transportation — land, sea and air. In addition to these and many other worthwhile jobs Continental is doing more than its part by producing on schedule engines for Army and Navy trainer planes, Army tanks, scout cars and many other applications to help keep America strong.

Continental Motors Corporation
MUSKEGON, MICHIGAN

water, removes all scale and rust from the cooling system and completely inhibits further formations, according to the manufacturer. The formula, "Bearite 22-A," consists of a number of especially developed vegetable substances which are entirely harmless to paint, rubber gaskets, metal, etc., because they react only in the presence of alkaline water, rust and scale deposits.—*Water Treatment Co. of America, 1159 Hodgkiss St., Pittsburgh, Pa.*



Explosive Rivets

DuPont has developed an explosive rivet made of aluminum alloy for use at points which are accessible only from one side. The explosive is detonated by an electric heating gun, one man setting 15 to 20 rivets per minute. A small charge of explosive in the shank of each rivet expands it accurately to a predetermined tightness when the electric heat is applied momentarily to the head. In addition to use in aircraft, it is believed that these rivets may find application in other industries. Manufacture in larger sizes, and of other metals including steel, seems within the realm of possibility.—*E. I. Du Pont de Nemours & Co., Wilmington, Del.*

Cable and Belt Vulcanizers

Because of the growing shortage of copper and its higher cost, repairing of rubber covered electrical cables is becoming more common. For this work Shaler has improved its industrial vulcanizers for use in replacing rubber insulation covering where cables are spliced or where insulation has become damaged. Interchangeable mold blocks to accommodate various size cables are provided. Other models are made for splicing round or flat rubber belts (up to 5 in.), all being electrically heated from 110 volt electrical circuits.—*The Shaler Co., Waupun, Wisconsin.*

THE SCORES of Barber-Greene Tamping-Leveling Finishers now speeding construction in America and England are laying the truest, most permanent bituminous courses ever laid, at new record speeds.

Projects employing Barber-Greene Finishers are using whatever material is best suited for the job—as the Barber-Greene beautifully lays all types of mix.

Having introduced "leveling without forms", "tamping into place", and many other quality building, cost reducing innovations over ten years ago, Barber-Greene now helps to make every Defense Dollar build more road, and more runway—faster, truer, more permanently.

Acquaint yourself with this ingenious machine.
Write for Catalog 879.

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TEN YEARS' RESEARCH
NOW SPEEDS DEFENSE

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Reduce Costs
Conserve Materials
Insure Safety
with WHITTEMORE STRAIN GAGES

The cost of engineering structures can be decreased through a more efficient use of material and the elimination of members which do not carry their share of the load. Safety can be insured by determining whether or not computed stresses are in close agreement with actual stresses.

Whittemore hand strain gages are inexpensive—can be used by observers having little training. With these, stresses in each member of a complex structure can be determined at a reasonable cost. Whittemore strain gages—rugged, simple, and accurate—are available in 2-in. and 10-in. gage lengths. Write for Bulletin N-153 describing these and other Southwark strain gages.

Baldwin Southwark

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NEW PUBLICATIONS

Trailers—A 32 page booklet describes Rogers trailers starting with some historical background which emphasizes the 25 years of experience of this organization in specialized hauling equipment. The trailers feature Loadability, Haulability and Brakeability, with all parts electrically welded. A full description is given of the various types and styles available for hauling loads from 5 to 60 tons. The book features the type "D" 60-ton trailer which has 16 rear tires to distribute the load.—*Rogers Bros. Corp., Albion, Pa.*

Porcelain Enamel—A booklet now available describes the uses and advantages of porcelain enamel and outlines several possible uses in engineering construction. It describes handling methods and lists the companies in the country engaged in porcelain enameling.—*Porcelain Enamel & Mfg. Co., Baltimore, Md.*

Power Shovel—A new bulletin describes the Keystone Model 19A 1¼ yd. standard shovel. The distinctive features of the machine are the use of planetary rotation clutches and employment of unusually large main drum clutches and braking surfaces together with a very powerful retraction drum. The bulletin contains 20 pages of illustrations showing all features of construction, operating clearances and crane capacity data. —*Keystone Driller Co., Beaver Falls, Pa.*

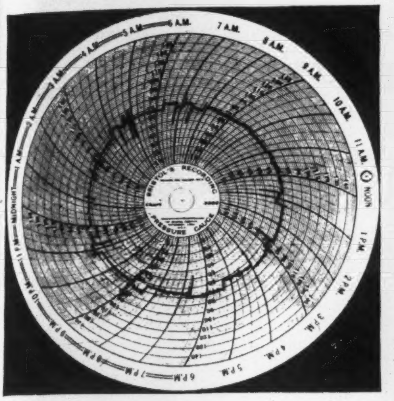
Elevator Buckets—Folder No. 1912 describes elevator buckets giving complete price and dimensional data for the several kinds available.—*Link-Belt Co., Indianapolis, Ind.*

Pumps—Bulletin No. 148 describes the improved Peerless Hydro-Foil Pump with an improved air foil design based on data developed in wind tunnel research. Hydro-foil impeller pumps are used in removing large volumes of water from deep wells, cofferdams, etc.—*Peerless Pump Co., 301 W. Ave., 26, Los Angeles, Cal.*

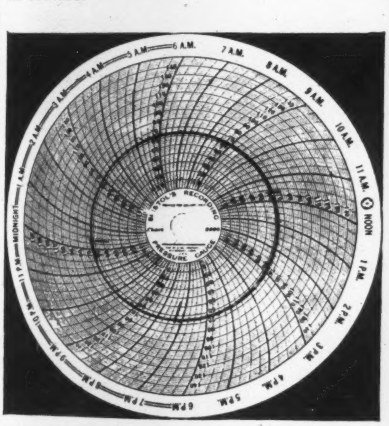
Clamshell Bucket— A mailing piece describes the Hayward digging bucket, in capacities from ⅜ to 2 yd.—*The Hayward Co., 50 Church St., New York City.*

Resurfacing and Widening Roads—"Asphalt for Reconstructing Strategic Networks" is the title of a folder giving suggestions for specifications for resurfacing and widening old roads on the strategic highway network. Equipment and materials required are described.—*The Asphalt Institute, 801 Second Ave., New York City.*

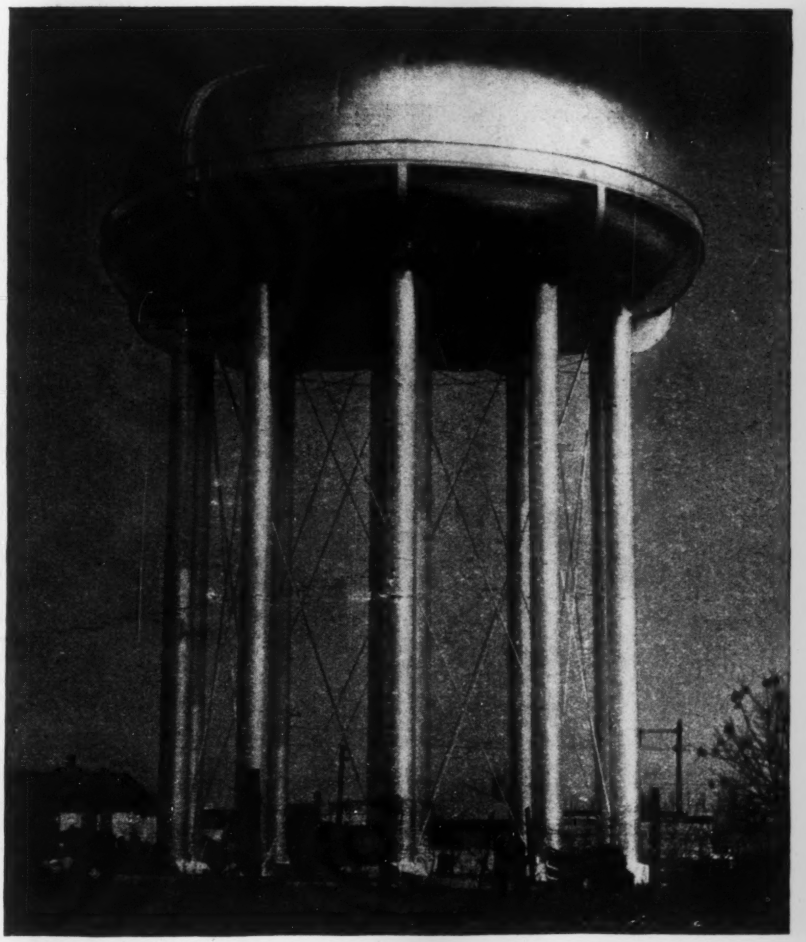
Before
BEFORE AND AFTER
Gave Way to
FOR THE DURATION



BEFORE: The above chart shows the pressure in the Dothan water system on February 5, 1939—before the new tank was in service.



AFTER: This chart shows the pressure in the water system on August 15, 1939—after the 750,000-gal. elevated water tank was placed in service.



Two years ago the City of Dothan, Ala., installed the above 750,000-gal. radial-cone tank in its water system to relieve the local power plant of the pumping power load during the day so that it could be used for cotton gin and oil mill operation. This is accomplished by pumping at night and letting the supply in the tank take care of water usage during the day.

In addition to releasing power generating capacity for other purposes, the present method of operating actually reduces pumping costs and improves distribution pressures. By pumping at night, the maximum 15-minute demand is held down to about 125 kilowatts, effecting a saving of approximately $1,500 per year.

The effect of elevated storage on distributed pressures in Dothan is told graphically in the two pressure charts at the left. Before the tank was in service there were frequent fluctuations of 10 lbs. per sq. in. or more. Now the variations, as shown on the lower graph, hardly show on the chart.

Countless cities with adequate elevated storage have reduced pumping costs and improved service at the same time. Many of them can, without impairing service, enlist their water storage tanks in the defense program by pumping more of their water requirements at night and thus release generating capacity formerly used during the day for manufacturing purposes.

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Cleveland.......2201 Builder's Exchange Bldg.
Philadelphia....1623-"1700" Walnut St. Bldg.
Boston...........1507 Consolidated Gas Bldg.
Houston.................5609 Clinton Drive
Tulsa.......................1617 Hunt Bldg.
Birmingham.........1520 North Fiftieth Street
Havana...................402 Edificio Abreu
Detroit.................1506 Lafayette Bldg.
San Francisco................1020 Rialto Bldg.
Los Angeles..............1411 Wm. Fox Bldg.

Plants at Chicago, Birmingham and Greenville, Pa. *In Canada:* Horton Steel Works, Limited, Fort Erie, Ont.

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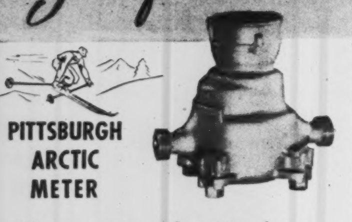

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Fluorescent Lighting—A minimum of copy and 61 large illustrations on fluorescent lighting fully explain this new "partner of production" in a 28 page booklet just off the press.—*General Electric Co., Nela Park, Cleveland, Ohio.*

Trencher—Details of design and construction improvement on the Model 11 utility trencher, smallest of the wheel type trenching machines, are contained in a new bulletin, No. 4B-11.—*Buckeye Traction Ditcher Co., Findlay, Ohio.*

Utility Tool—Application data on the Util-A-Tool is available in a mailing piece describing this handy tool which consists of nine pieces of equipment used in various combinations to perform various pulling and pushing jobs.—*Templeton, Kenly & Co., 1020 S. Central Ave., Chicago.*

Machinery for Roads and Streets—A new catalog covers the complete White line of machinery for construction and maintenance of roads and streets. It includes traffic line markers, aggregate dryers, portable asphalt plants, concrete vibrators, asphalt and tar heating kettles, front end loaders for industrial tractors and oil burning kerosene torches and burners.—*White Mfg. Co., Elkhart, Ind.*

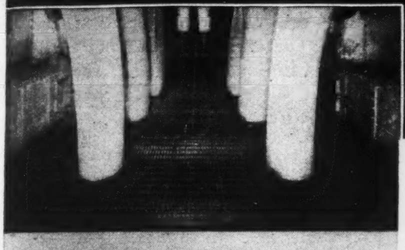
Protective Fence—A new catalog, No. 110, consists of 40 pages showing protective fences of the chain link type. An ingenious table gives pertinent information about all types of fence and structural details are shown by simple line drawings.—*Anchor Post Fence Co., Baltimore, Md. or San Francisco, Cal.*

Mixer—A new 4 page circular describes the Ariens Aggmixer for mixed-in-place construction. Included with this circular are four separate sheets on mixed-in-place job facts on oil-sand construction, bituminous surface, soil-cement base and farm-to-market roads.—*The Ariens Co., Brillion, Wis.*

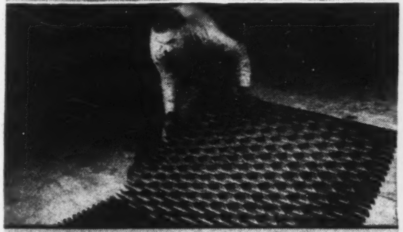
Wire Rope Safety Booklet—Recognizing that safety is an all-important consideration in every industrial operation, a comprehensive booklet has just been issued on the safe use of wire rope. This gives information on breaking strengths, safety factors for principal rope applications, and offers constructive information on the effects of acceleration, the various grades of wire rope, and contains suggestions for the correction of operating factors affecting safety such as abrasion, bending fatigue, reverse bends, etc.—*The Hazard Wire Rope Div., American Chain & Cable Co., Wilkes-Barre, Pennsylvania.*

WALK AS SURE-FOOTED AS A CAT!

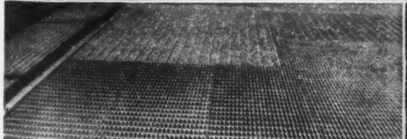
FACTS ABOUT OPEN STEEL GRATING



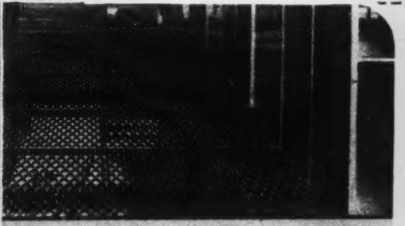
ECONOMICALLY INSTALLED. Every section of Open Steel Grating is built to the requirements of the individual job. This factory layout insures speedy installation and perfect fit.



LIGHT WEIGHT. Every pound of material is used, with maximum efficiency to carry or distribute loads—meaning less dead weight, lighter supports, reduced erection costs.



SELF-CLEANING. Open Steel Gratings do not accumulate dust, dirt, grease, oil or moisture. Their construction makes them virtually self-cleaning.



FREE CIRCULATION OF LIGHT AND AIR. Because of its construction, Open Steel Grating lets light through to spaces above and below—gives free ventilation and escape for fumes and gases.

ALTHOUGH the surface of an Open Steel Grating Floor is even and regular, it also has a tendency to prevent slipping and sliding. This because its various members run at oblique or right angles to each other. And, because of its *open* construction, it does not accumulate dust, dirt, grease, oil or other skid-inducing substances.

Open Steel Floor Grating is factory-fabricated from a combination of structural steel members, simply and rigidly connected in a manner that makes it possible for them to carry and distribute a given load with an ample safety factor.

The non-slip surface of Open Steel Grating Floors does not *wear* smooth. It remains as long as the floor itself. For complete technical information on the many types of durable, fireproof, rigid Open Steel Grating Floors that are factory-fabricated to *your* individual requirements, write today for the free booklet, "New Ideas in Functional Floor Design."

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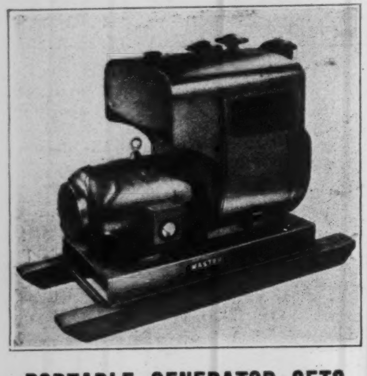

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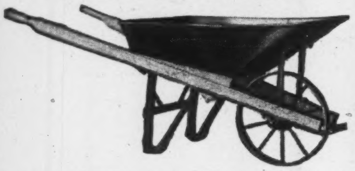

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Look up the explicit treatment of such topics as:—

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Manufacturers' Activities

Henry Knowlton has been appointed as sales promotion manager of the Airtemp Division Chrysler Corp., Dayton, Ohio. For the past four years Mr. Knowlton has been a member of the editorial staff of *Air Conditioning & Refrigeration News*, and during 1939 Mr. Knowlton did preliminary organization work with the National Air Conditioning Association.

The Pittsburgh Equitable Meter Co. has announced that it has acquired the assets of the Larsson Machine Tool Works of Berkeley, Calif. This new acquisition, which provides the Pittsburgh firm with a modern, self-contained tool plant fully equipped to manufacture dies, tools and special equipment, will be utilized for experimental work.

Keystone Carbon Co., Inc., St. Marys, Pa., has announced the appointment of the following distributors for their "Self-lube" self-lubricating porous bronze bearings: The Ohio Ball Bearing Co., Cleveland; Indiana Bearings, Inc., Indianapolis; West Virginia Bearings, Charleston, W. Va.

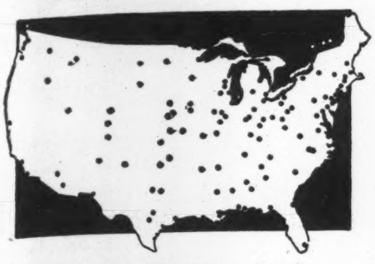
The B. F. Goodrich Co. has announced several changes in their western organization: a new California district has been created, with headquarters at Los Angeles and a branch office in San Francisco, to include the present Los Angeles district territory and revised San Francisco district territory. Office addresses remain unchanged. L. L. Horchitz, who has been manager of the Los Angeles district since 1929, is named manager of the new district, with H. A. Schultz branch manager at San Francisco; W. D. Rigdon, who has been manager of the San Francisco district since 1922, is placed on the company's retirement list. C. M. Christensen has been named manager of the Denver district, succeeding Max Schmidt, who remains on the district staff in an advisory capacity.

Equipment Corp. of America, originally a manufacturer of concrete mixers and similar equipment in Chicago, and now the country's largest buyer, rebuilder and seller of used construction equipment, has opened offices in the Hudson Terminal Building in New York. The new office is the result of a vast increase in purchases and rentals made by contractors on the eastern seaboard as a result of the national emergency. John A. Conboy will be in charge of the New York office. C. T. Beebe, formerly sales representative for the Austin Western Co., will succeed Mr. Conboy as assistant to M. E. Jost at Philadelphia.

CONSTRUCTION REPORTS

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York
ELSIE EAVES, Manager *SCOTT McLEOD, Statistician*
(Daily service also available—Write for details)

Location of ENR Correspondents



Symbols and Abbreviations Include:

†	Federal Government
★	Project of $500,000 or over
ENR	Engineering News-Record
CD	Engineering News-Record Construction Daily

Projects—By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger; water supply, earthwork, waterworks, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

Classes of Construction

(Named in order of Listing)

Water Supply
Sewers, Waste Disposal
Bridges, Grade Cross'gs
Streets & Roads
Earthwork, Waterways
Unclassified
Latin America
Public Buildings
Commercial Buildings
Industrial Buildings

Stages Reported

PROPOSED: (except Streets & Roads):

BIDS ASKED (new announcements only. For full calendar, see also preceding issues of ENR);

LOW BIDDERS: All low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.

CONTRACTS AWARDED: Except awards to low bidders previously reported in low bidder stage.

Dates shown are of issue in which last previous report was published.

WATER SUPPLY

PROPOSED WORK

★**Calif., Napa**—Dam in Rector Canyon to provide additional water facilities for state institutions in vicinity. $757,000 special appropriation bill signed. E. Hyatt, P. Wks. Bldg., Sacramento, state engr.

★**Mass., Springfield**—R. L. Putnam, mayor, Municipal Bldg., water sys. exten., auxiliary pipe line, Springfield to Provin Mt. Reservoir, 8 mi. 50 in. diam. pipe. $1,000,000.

Mo., St. Louis County—Pub. Water Supply Dist. 1 of St. Louis Co., c/o H. R. Trautwein, clk. Bd. Directors, c/o Washington School, Kerth and Butler Hill Rds., defeated proposal to issue $38,000 general obligation and $37,000 special obligation bonds for construction water supply and distr. sys., mains, fire hydrants, etc. in district embracing Washington School Dist. and part of Concord School Dist. $259,467. Robert Francis Denny Co., 8004 Bonhomme Rd., Clayton, engrs. CD 7/9—ENR 12/12.

N. J., East Orange—Watermains, $33,500. WPA. W. Willegarod, Town Hall, town and WPA engr.

N. Y., Downsville—Village Bd., voted $33,500 bonds purchasing, rehabilitating water supply sys.

★**O., Sandusky**—A. J. Lauber, city mgr., WW sys. addn. to provide service for New Plum Brook Ordinance Plant, other industries. $500,000. Application for funds made to Federal Govt. R. R. Smith, city engr.

O., Steubenville—Extens., imprvs., WW sys., water softening facilities. $175,000. R. F. MacDowell, Chester-Twelfth Bldg., Cleveland, engr.

O., Waynesville—Plan $49,000 bond election, waterworks distr. sys. W. R. Hatfield, mayor. Ellis & Wertz, 122 Main St., Van Wert, engrs.

O., Winchester—W. C. Neal, village clk., $20,000 special bond election soon, WW sys., filtration plant. Over $20,000.

Pa., North East—Boro Council, North East, 10 or 12 in. c.i. main. $15,000.

Tenn., Winchester—J. R. Norton, mayor, repairing, imprv. water sys. and filtration plant. $25,000.

Tex., Abilene—Expansion, impvg. WW sys. $176,000 WPA. Freese & Nichols, Capps Bldg., Fort Worth, engrs.

Tex., Brownwood—City, c/o W. Mayes, WW imprvs. $320,000. Applied for PWA funds. J. Montgomery, Littlefield Bldg., Austin, engr.

★**Tex., El Paso**—J. E. Anderson, mayor, WW imprvs. (Tex. 41-125) $619,999. Applied for PWA funds. Headman, Ferguson & Carollo, Phoenix, Ariz., engrs. CD 7/28.

Tex., Goose Creek—J. H. Meek, mayor, WW imprvs. $145,000. Applied for PWA funds. B. B. Williams, city engr. C. P. Smith, Orange, consult. engr. CD 7/23.

Tex., Houston—Bids soon laying 6- to 18-in. c.i. watermains. $60,000. City Engineering Branch, engrs.

Tex., Palacios—H. C. Lewis, mayor, WW exten., fire hydrants, valves, etc., Texas 41-104. $111,350. Filed application with PWA. J. J. Rady, Majestic Bldg., Fort Worth, consult. engr. J. Montgomery, c/o Littlefield Bldg., Austin, engrs. CD 7/3—ENR 7/10.

Wash., Longview—3 m. g. filter plant, $92,063. Capacity will be increased to 4 m. g. if $15,000 PWA funds can be secured. J. W. Cunningham, Spalding Bldg., Portland, Ore., engr.

Wis., Livingston—WW sys. Over $15,000. General Eng. Co., Portage, engrs. H. E. Eustice, town clk.

Wis., Theresa—A. W. Boegel, town clk., WW sys. $37,000. W. G. Kirchoffer, 22 N. Carroll St., Madison, engr. CD 7/10—ENR 7/17.

Wyo., Laramie—E. W. Waddleton, clk., increasing water supply, wells, piping. $15,000. F. Giesler, city engr.

B. C., South Westminister—Extend. WW sys. $25,000.

N. S. Dartmouth—Water supply and main exten. to provide for 10 m.g.c. additional daily and storage tank 50,000 gal. for reserve supply. J. L. Allen, Town Hall, engr.

Ont., Fingal—Dpt. Transport, R. Lyons, comr., Fingal, bids soon 6¾ mi. 6- to 12-in. mains, etc., to bombing school. $150,000.

Ont., Belleville—Gore & Storrie, engrs., 1130 Bay St., Toronto, bids soon filtration facilities, exten. water purification plant, main, and overhead tank, for City. $75,000-$100,000.

BIDS ASKED

Bids Asked August 6

Md., Baltimore — Bd. Awards, City Hall, furnishing, del. brass pipe and fittings to Bureau of Water Supply.

Md., Hyattsville—Washington Suburban Sanitary Comm., Owens Ave., c.i. watermains and vitr. sewers, Contr. 130-W and S; adv. ENR 7/31.

Bids Asked August 11

Vt., Brattleboro—Bd. Selectmen, Town Hall, 2.7 mi. 10 in. c.i. pipeline, 400 ft. bridge crossing. $52,000. CD 7/15—ENR 7/17.

LOW BIDDERS

†California—Bureau Reclamation, Old Post Office Bldg., Sacramento, water tanks, reservoir and oil storage tank, Southern Pacific R.R. Relocation, Kennett Div. from Chicago ridge & Iron Co., 416 Rialto Bldg., San Francisco, **$66,585.** CD 6/27—ENR 7/3.

Wash., Tacoma—City, July 21, furnishing, laying in ditch 9,461 ft. 52 in. concrete pipe for water supply line, from American Concrete & Steel Pipe Co., 459 E. 15 St., $181,646; furnishing, del. 9,461 ft. 52 in. coal tar enameled steel pipe at side of trench, from Steel Tank & Pipe Co., 518 N. E. Columbia Blvd., Portland, Ore., **$128,178.** CD 7/10—ENR 7/17.

CONTRACTS AWARDED

Calif., Loyalton—Town Trustees, WW sys., to McGuire & Hester, 796 66 Ave., Oakland. **$27,280.** Bids 7/15. CD 6/9.

Colo., Denver—City and Denver Co., City-County Bldg., ½ mi. tunnel, to Ball & Sowell, Idaho Springs, **$127,342.** Bids 7/8. CD 7/1.

Conn., Manchester—Manchester Water Co., 187 N. Main St., 2 concrete water storage reservoirs, incl. piping, gates, etc., to Alexander Jarvis Co., 416 Center St. Est. **$75,000.** F. Bowen, city engr.

†Ill., Scott Field (Belleville)—Con. Q.M., 3 m.g. steel water reservoir, to Chicago Bridge & Iron Co., 332 S. Michigan Ave., Chicago. **$52,510.**

†Ia., Fort Des Moines—Con. Q.M., pump. station and force mains, to Lippert Bros., Boone, **$42,887.**

Kan., Topeka—L. B. Smith, water comr., water tower, to Chicago Bridge & Iron Wks., 332 S. Michigan Ave., Chicago, Ill. **$94,700.** Bids 7/1. Paulette & Wilson, 1006 Kansas Ave., Topeka, engrs.

N. J., East Orange—Watermains, Grove Pl., Linden Ave. and Beech St., **WPA. $35,000.** W. Willegarod, Town Hall, town and WPA engr. CD 6/15—ENR 6/19.

†N. J., Pedricktown—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., watermains, Delaware Ordnance Depot, **WPA. $35,600.** CD 6/30—ENR 7/3.

†N. Y., Fort Jay—Con. Q.M., 120 Wall St., New York, water reservoir, to Auserehl & Son Constr. Corp., 95-40 157 St., Jamaica. **$135,000.**

★**N. Y., Kew Gardens** — President Queens Boro, Boro Hall, 120-55 Queens Blvd., extens., imprvs. watermains, Queens Boro. **WPA. $1,014,571.** W. W. Johnston, 70 Columbus Ave., New York, dir. Div. Operations.

N. Y., New York—President Manhattan Boro, Municipal Bldg., watermains, **WPA. $232,906.** W. W. Johnston, 70 Columbus Ave., dir. Div. Operations.

N. Y., New York—Bd. Water Supply Gas & Electricity, Municipal Bldg., building alterations, grading, landscaping, Jerome Pump. Sta., **WPA. $168,755.** W. W. Johnston, 70 Columbus Ave., dir Div. Operations.

N. Y., St. George—Bd. Water Supply, Gas & Electricity, Municipal Bldg., New York, exten. c.i. watermains. Richmond Boro, **WPA. $417,843.** W. W. Johnston, 70 Columbus Ave., New York, dir. Div. Operations.

†N. Y., Yaphank—Con. Q.M., 120 Wall St., New York, water and sewer extens., addns. to 35 buildings, to South Shore Constr. and Dredging Co., 100 West Ave., Patchogue, **$31,235.**

Wash., Fort Lewis—Con. Q.M., water supply line, water purification sys., to Soule & Walters, Elma, **$22,557.**

Man., Morden—Prairie Farm Rehabilitation Bd., 910 McCallum Hill Bldg., Regina, Sask., water storage project, Dead Horse Creek, Water Storage Scheme, to General Contractors, Thode Bros., Ltd., Dundurn, Sask., **$48,367.**

Ont., Windsor—Pub. Utilities Comn., Canada Bldg., filtered water reservoir, to Keystone Contractors, Ltd., 732 Langlois Ave., **$71,000.** Bids 7/23. CD 7/21—ENR 4/24.

Que., Riviere du Moulin — Reconstructing aqueduct, to X. Neron, 31 Lafontaine St., Chicoutimi, **$17,711.** CD 7/1.

SEWERS, WASTE DISPOSAL

PROPOSED WORK

Ala., Huntsville — A. McAllister, mayor, sewerage disposal plant.

Calif., Fairfield—Solano Co., surveys, sewage pump. plant. Over $25,000. F. A. Steiger, Court House, co. surv.

Calif., Los Angeles—Bd. P. Wks., City Hall, sanitary sewers Mammoth Ave., Ventura to Valley Vista Blvds. $34,522. L. Aldrich, City Hall, engr.

Calif., Monterey—1,270 lin. ft. rein.-con. storm sewer, appurtenances, Figueroa St. Over $25,000. CD 5/13—ENR 5/15.

Calif., San Mateo—Vitr. sewers, manholes, catchbasins, etc., in streets in R. I. 41-15.

Calif., San Pablo—San Pablo Sanitary Dist. voted $59,800 bonds, sewers, San Pablo Gardens, Tract.

Calif., San Luis Obispo — Surveys sewage disposal plant. Over $25,000. PWA. H. N. Jenks, 345 Madrone Ave., Palo Alto, engr. CD 4/30—ENR 5/8.

Calif., Toulumne City—Sanitary Dist., sewerage sys. with Imhoff tank. $35,000. F. Dunlap, Sonora, engr.

Conn., Southington—Boro, Bd. Selectmen, Town Hall, lateral sewers, Old Turnpike Rd., Southington and Burwell Aves.; connecting sewer across Holcomb School Yard; sewer in Summit St. $28,500.

Conn., Stratford—W. Shea, town mgr., Town Hall, brick, steel garbage, rubbish disposal plant. $200,000. M. J. Jankowsky, town engr.

Fla., Lakeland — Sewage disposal plant $150,000; system of wells $75,000.

Ill., Savanna—Exten. sanitary sewerage sys., sewage pump. station. $65,660. H. R. Green Co., 417 1 Ave. S.E., Cedar Rapids, Ia.

Ia., Ames—Exten. sewerage sys., $25,000. J. Prather, city clk.

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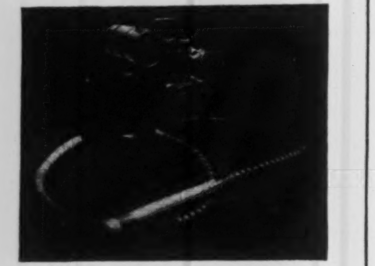

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SEWERS, etc. (Proposed Work, Cont'd.)

Ia., Hampton — Survey enlarging, imprv. sewage disposal plant. Over $25,000. E. E. Schenk, Waterloo, engr.

★**La., De Ridder**—C. R. Middleton, mayor, sanitary sewer and water exten., LA-16-102. $508,221. Application filed for PWA funds.

†**N. J., Clark**—Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., vitr. tile sanitary sewers, various streets. $55,500. WPA. J H. Weitzen, Smith and Hobart Sts., Perth Amboy, WPA and owner's engr.

N. J., Freehold — Monmouth Co., Court House, drainage ditches along meadows. $56,890. WPA. W. D. Cougle, 1102 S. Broad St., Trenton, WPA and owner's engr.

N. J., Hackensack—Bergen Co., Administration Bldg., excavating, drainage sys., various roads. $60,500. WPA. J. F. Sheehan, foot of 5 Ave., Paterson, WPA and owner's engr.

N. J., Maywood—Boro, Boro Hall, bids soon 1,800 ft. trunk sewer, storm water drains, sewage disposal plant alterations and addns. $230,000. McClave & McClave, 600 George Rd., Cliffside Park, engr.

Pa., Montrose—Boro Council, D. Corwin, pres., imprvs., exten. municipal sewerage sys. $50,000-$60,000.

S. D., Huron—Imprv. sewage disposal plant. $34,000 bond issue approved.

Tex., Abilene — Disposal plant. $120,000. WPA. Freese & Nichols, Capps Bldg., Fort Worth, engrs.

Tex., Abilene—Expanding, imprv. sanitary sewerage sys. collecting lines. $180,000. WPA. Freese & Nichols, Capps Bldg., Forth Worth, engrs.

Tex., Beaumont—R. Edmonds, mgr., 1 story, brick, concrete, steel incinerator. $70,000. J. C. Reid, Beaumont, engr. Application filed with PWA for funds.

Tex., Brownwood—City, c/o W. Mayes, 35 ton incinerator, etc., $64,000; 49,360 lin. ft. 6- to 15-in. sanitary sewerage sys., $135,000; 28,170 lin. ft. 18- to 78-in. storm sewers, $235,000. J. Montgomery, Littlefield Bldg., Austin, engr. Applied for PWA funds.

★**Tex., El Paso**—Sanitary sewers. $622,000.

★**Tex., Galveston**—I. Predicki, city aud., WW imprvs., wells, supply mains, distr. sys., exten., storage reservoirs, pump. sta., enlarging booster sta., etc. $1,282,000. Application filed with PWA. Ford, Bacon & Davis, Santa Fe Bldg., engrs. CD 5/22—ENR 5/29.

Tex., Goose Creek—J. H. Meek, mayor, sanitary sewerage sys. imprvs., enlarging disposal plant, etc. $144,000. Appli. for PWA funds. B. B. Williams, city engr. C. P. Smith, Orange, consult. engr. CD 7/23.

★**Tex., Houston**—Bond election soon disposal plant, sanitary sewers. $3,000,000.

★**Tex., Houston**—Bond election soon, storm sewers. $2,500,000.

Tex., Morton—Sanitary sewerage sys., imprvs. $27,000. Bonds voted. H. N. Roberts, 2420 20 St., Lubbock, engr.

Tex., Orange—Installing storm sewers, $31,800; sewage disposal plant, $70,000; drainage (inner dist.), $54,000.

Tex., Palacios—B. F. Belknap, city secy., Palacios, vitr. tile sanitary sewer exten., cleanouts, manholes, disposal plant (Texas 41-103). $59,460. Application filed with PWA. J. J. Rady, majestic Bldg., Forth Worth, consult. engr. J. Montgomery, c/0 Littlefield Bldg., Austin, engrs. CD 7/3—ENR 7/10.

Tex., Teneha—Disposal plant, additional collecting lines. $40,000. Freese & Nichols, Capps Bldg., Fort Worth, engrs.

Tex., Texas City—C. Nessler, mayor, 1 story, 19x41 ft., concrete incinerator. $33,000. Application filed with PWA. J. J. Rady, Majestic Bldg., Fort Worth, consult. engr. CD 7/22—ENR 7/24.

Wis., Theresa—Dr. A. W. Boegel, town clk., sanitary sewerage sys. $41,000. W. G. Kirchoffer, 22 N. Carroll St., Madison, engr.

★**Que., Montreal**—J. E. Gauthier, city clk., rejected bids May 23, sewers Chester Ave., Cote St. Luc and Queen Mary Rds. $600,000. Will readvertise. CD. 6/16—ENR 6/19.

BIDS ASKED

Bids Asked August 7

N. Y., Kew Gardens—Sewers appurtenances, 91 and 92 Sts., 23 and 24 Aves., constructing automatic electric pump sta., sanitary sewers, etc.

O., Cleveland—F. Foy, city purch. agt., City Hall, 40x40 ft. rein.-con. sewage pump. station, Greyton Rd. $40,000. No bids received 7/17. S. H. Murdock, 517 City Hall, engr. CD 7/15.

Bids Asked August 8

Wis., Hales Corner—Hales Corners, Sanitary Dist., R 4, Box 275, West Allis, vitr. clay and c. i. sewer, c. i. force main, etc. Mead, Ward & Hunt, Madison, engrs. CD 1/29—ENR 2/2.

Bids Asked August 11

Calif., Los Angeles—Lakewood Village Public Utility Dist., Lakewood Village (Los Angeles Co.), 15,000 lin. ft. 24 in. sanitary sewer. Over $25,000. Currie Eng. Co., 219 Andreson Bldg., San Bernardino, engrs. CD 6/6—ENR 6/19.

Bids Asked August 12

Idaho, Pocatello—Single sewage treatment plant, raw sewage pump. station and housing bridge, 2 sludge digesters, digester house, clarifier control house and outfall sewer pipe line, etc. Over $25,000. R. J. Briggs, Boise, engr.

N. J., Maywood—Mayor and Council, Boro Hall, sewage treatment works. McClave & McClave, 600 Gorge Rd., Cliffside Park, boro engrs.; adv. ENR 7/31.

Bids Asked August 13

Calif., Los Angeles—Sanitary sewers Colby Ave. and Gateway Blvd. Sewer Dist. $45,265. L. Aldrich, City Hall, engr.

Bids Asked about September 1

S. C., Greenwood—2 sewage disposal plants, $100,000. Wiedeman & Singleton, Candler Bldg., Atlanta, Ga., engrs. CD 7/16—ENR 7/18.

LOW BIDDERS

Okla., Tulsa—W. R. Wooten, city engr., July 15, sewage disposal plant, from W. R. Grimshaw, Philtower Bldg., **$118,245.** CD 6/17—ENR 6/19.

CONTRACTS AWARDED

†**Ind., Evansville**—U. S. Eng., P. O. Box 59, Louisville, Ky., 5 pump. plants, electrical installation complete with substations, sewers, manholes, to Pioneer Contract Co., Inc., Evansville, **$310,713.** CD 5/9—ENR 5/15.

Ia., Fort Dodge—Grease removal unit, municipal sewage disposal plant to Weldon Brothers, Iowa Falls, **$53,005.** CD 7/2—ENR 7/10.

†**N. J., Clark**—Federal Works Agency, Wash., D. C., storm drains, vitr. tile sanitary sewers, **WPA. $53,250.** CD 7/11—ENR 7/17.

N. J., Hackensack—Bergen Co., Administration Bldg., drainage sys., ditches, masonry wall, grading, clearing roads, **WPA. $52,878.** J. H. Sheehan, foot of 5 Ave., Paterson, engr.

N. J., Plainfield—24 in. sanitary relief sewers. **WPA. $55,000.** W. D. Cougle, 1102 S. Bread St., Trenton, WPA and owner's engr.

N. Y., Kew Gardens—President Queens Boro, Boro Hall, 120-55 Queens Blvd., storm drains, etc. 109 Ave. and Inwood St., Ozone Park, **WPA. $64,304.** W. W. Johnston, 70 Columbus Ave., New York, dir. Div. Operations.

N. Y., New York—President Manhattan Boro, Municipal Bldg., F. T. R. Sewers, W. 127 St. between 7 Ave. and Lenox Aves., **WPA. $101,293.** W. W. Johnston, 70 Columbus Ave., dir. Div. Operations.

†**Tex., San Antonio**—U. S. Eng., Federal Bldg., Galveston, sewers, water, gas and electric for Cadet Corps Housing Area, Kelly Field, to Christy & Baskett, 312 Melrose St. Est. **$96,000.** Awarded 7/17.

Wis., Cudahy—J. F. Keller, city clk., sewers, watermains, S. Packard Ave., to Wenzel & Henoch Co., 1524 N. 27 St., Milwaukee, **$26,459.**

Ont., Toronto—East York Twp., 443 Sammon Ave., incinerator plant, to Francis Hankin & Co. Ltd., 165 Spadina Ave. About **$57,000.** CD 12/10—ENR 12/12.

BRIDGES GRADE CROSSINGS

PROPOSED WORK

California—C. H. Purcell, engr. State Hy. Dpt., Sacramento, rejected bids 5/21, repairing bridge grading, approaches over Indian Creek, 11.2 mi. west of Quincy, Plumas Co. CD 5/5—ENR 5/8.

O., Cleveland—F. Foy, city purch. agt., City Hall, 120 ft. rein.-con. pedestrian tunnel, 10 ft. diam., paving brick exterior, Seager Ave. and Penn. R. R., $40,000. J. M. Heffelfinger, 518 City Hall, engr.

Okla., Apache—State Hy. Dpt., Oklahoma City, made preliminary plans overpass over Rock Island Ry., Caddo Co. $32,000. V. T. Moon, Oklahoma City, hy. engr.

Pa., Williamsport—City Council, Williamsport, State Hy. Dpt., Harrisburg and Boro of South Williamsport, steel, concrete bridge over Susquehanna River, Market St. Over $125,000. L. Mussina, City Hall, city engr. T. C. Frame, Harrisburg, ch. engr. State Hy. Dpt.

Tex., Houston—Bond election soon, rein.-con., steel bridge. $325,000.

Tex., Victoria—Victoria Co., c/o Judge, Victoria, rein.-con. bridge. $68,000.

★**Wash., Seattle**—Bids in October, rein.-con. viaduct, Spokane St. $750,000. C. L. Wartelle, County-City Bldg., engr. CD 2/20—ENR 2/27.

Que., Val Brillant—Province of Quebec, Quebec City, subway under Canadian National R. R. $50,000. E. Gohier, Dpt. Roads, Quebec City, engr.

BIDS ASKED

Bids Asked August 6

Me., Fairfield—State Hy. Comm., L. D. Barrows, ch. engr., Augusta, Wyman Crossing under tracks Maine Central R. R., Project SN FAGM 150 B and F (2). $250,000.

BRIDGES, etc. (Bids Asked, Cont'd.)

Bids Asked August 8

North Dakota—State Hy. Dpt., Bismarck, underpass and approach 1.054 mi. S.H. 14, Towner, McHenry Co.

Bids Asked August 11

N. Y., Mount Vernon and **Yonkers** — Westchester Co., C. A. Garfield, engr. in charge constr., County Office Bldg., White Plains, Fleetwood Viaduct Access intersection, Bronx River Parkway, Mount Vernon and Yonkers, Constr. 435-A; 1,800 lin. ft. center island on Sawmill River Parkway, Yonkers, Contr. 437; adv. ENR 7/31.

Bids Asked August 12

★**Mass., Salem**—Commonwealth of Mass., Dpt. P. Wks., H. L. MacDonald, comr., Boston, concrete rigid frame bridge over B. and M. R. R., Bridge St., incl. 9,100 sq. yd. Class 1 bituminous concrete paving. **$550,000.** CD 6/9—ENR 6/12.

South Dakota — State Hy. Dpt., Pierre, bridge, box culverts, FAGH 459 A (1) McCook Co.; and FAGM 459 B (1) Hanson Co.

Bids Asked August 13

Delaware—State Hy. Dpt., W. W. Mack, ch. engr., Dover, overhead crossing, High St., Seaford, Sussex Co., Contr. 699.

Bids Asked August 21

†Virginia — Public Roads Administration, Winder Bldg., 17 and F Sts. N.W., Wash., D. C., rein.-con. grade separation structure under Atlantic Coast Line Railroad, brick faced portals, other work, Project 5A1, Petersburg National Military Park, Dinwiddie Co.; adv. ENR 7/31.

Bids Asked August 28

Ont., Iroquois Falls—Province of Ontario, R. M. Smith, deputy Minister Dpt. Hys., Toronto, bridge over Meadow Creek, $30,000. Dpt. Hys., Toronto, engrs.

Ont., Kenora—R. M. Smith, Dpt. Hys., Toronto, bridge, culverts. $40,000. E. A. Kelly, Kenora, **Dpt. Hys., engr.**

LOW BIDDERS

Alabama—State Hy. Dpt., Montgomery, July 18, widening overpass, approaches, Shelby Co., from Phillips Constr. Co., Birmingham, **$54,839;** bridges, Clay and Coosa Counties, from R. T. Smith, 215 Atlanta Ave., Atlanta, Ga., **$36,674.** CD 7/10, under Roads.

California—C. H. Purcell, engr. State Hy. Dpt., Sacramento, July 23, reni.-con. bridge, Glenn Co., from C. C. Gildersleeve, 2611 Piedmont Ave., Berkeley, **$28,693;** 2 rein.-con. bridges, Lake Co., from L. Biasotti, P. O. Box 587, Stockton, **$38,718.** CD 7/9.

Calif., Los Angeles—State Hy. Dpt., 808 State Bldg., July 24, 2 bridges, Figueroa St., at Amador St. and Solano Ave., from Oberg Bros., 612 E. 80 St. **$54,590.** CD 7/8—ENR 7/10.

Colorado—State Hy. Dpt., Denver, July 23, steel, concrete bridge, approaches, 0.227 mi. Jefferson Co., from Steinwald & Watts, 2729 Jackson St., Denver. **$47,818.** CD 7/14—ENR 7/17.

Florida—State Rd. Dpt., Tallahassee, July 24, 2 steel, concrete bridges, Baker Co., from N. P. Ives, Lake City. **$29,563.** CD 7/17.

Nebraska—State Dpt. Road & Irrigation, Lincoln, July 17, culverts Tekamah-Decatur Rd., from Nichols Constr. Co., Geneva, **$31,113** ***culverts, bridge, Hebron-Nelson Rd., from Roberts Constr. Co., 1018 Terminal Bldg., Lincoln, **$34,855*****bridges, Fairmont-York Rd., from Capital Bridge Co., 1000 N. 9 St., Lincoln, **$43,202.** CD 7/9.

North Dakota—State Hy. Dpt., Bismarck, July 25, 412 ft. bridge and approach road imprv., SN-FAP 307 B, Billings Co., from Northwestern Eng. Co., Rapid City, S. D. **$135,700.**

O., Lowellville—Mahoning Co., Youngstown, new 650 ft. bridge over Mahoning River, on Lowellville-Bedford Rd., from P. DiCiocci, 412 Poland Ave., Struthers, **$121,890.** Est. $125,000 CD 7/8—ENR 7/10.

★**South Carolina** — South Carolina Pub. Serv. Auth., at office Harza Eng. Co., engr., 27 Cumberland St., Charleston, July 15, Atlantic Coast Line Railroad bridge over tailrace of Santee-Cooper Project, Berkeley Co., from Virginia Bridge Co., Healey Bldg., Atlanta, Ga., **$547,840;** interlocking equip., from Union Switch & Signal Constr. Co., 350 5 Ave., New York, N. Y., **$63,435.** CD 6/17—ENR 6/19.

CONTRACTS AWARDED

Calif., San Jose—Santa Clara Co., rein.-con. bridge over Coyote Creek, Superv. Dist. 2, to F. Bryant, 429 Hazelwood Ave., San Francisco, **$25,923.**

Massachusetts—Commonwealth of Mass., Dpt. P. Wks., H. L. MacDonald, comr., Boston, Chase's Crossing, steel stringer bridge and section concrete highway, Northbridge, to Carlo Bianchi & Co., Inc., 24 Union Ave., Framingham, **$107.796.** Bids 5/27, awarded 7/23. CD 5/13—ENR 5/15.

Montana — State Hy. Comn., Helena, 3 treated timber pile bridges, 1 rein.-con. bridge, Blaine Co., to W. Mackin, Billings, **$26,950** ***rein.-con. viaduct, timber stockpass and pile bridge, Fergus Co., to F. B. Dudley, 3021 2 Ave. N., Great Falls, **$41,073*****steel, concrete bridge 0.131 mi. and 0.332 mi. Glacier Co., to T. Staunton, 422 5 St. N., Great Falls, **$157,968.** Grand total, $225,991. Bids 7/22.

N. J., Atlantic City—Atlantic Co., Court House, bridges throughout county, **WPA. $57,500.** G. R. Swinton, 930 Atlantic Ave., Atlantic City, WPA and owner's engr. CD 6/23—ENR 6/26.

Wis., Milwaukee—Falk Corp., 3001 W. Canal St., design and construction rein.-con. viaduct and ramp, to Klug & Smith Co., 111 E. Wisconsin Ave. Est. **$60,000.**

STREETS AND ROADS

BIDS ASKED

Bids Asked August 4

Pa., Temple—Boro Council, A. E. Faust, secy., 5055 Kutztown Rd., 3 in. asphalt on stone paving. $25,000.

Bids Asked August 5

N. J., Haddonfield—Type FA-BC-1 surfacing 7,265 sq. yd. Haddon Ave. W. H. McNamara, 101 N. 7 St., Camden, engr.

Bids Asked August 6

Colorado—State Hy. Dpt., Denver, oil processed surfacing 14.497 mi. Combined SN FAP Nos. 25-E(1), 233-E-2 and 233-G(1), Summit Co. C. D. Vail, State Office Bldg., Denver, engr.

Kansas—State Hy. Dpt., at office Co. Clk., Manhattan, single asphalt surface treatment 13.831 mi. K1103, Parts 1 and 2, Riley Co.

Mass., Dorchester (sta. Boston)—City of Boston, Dpt. P. Wks., City Hall Annex, Boston, bituminous concrete paving, sewerage work in Glover Court, etc. $30,000.

N. J., Cranford—Modified bituminous penetration macadam surfacing 4,408 sq. yd. Lincoln Ave., Sect. 3. T. J. McLaughlin, Town Hall, engr.

N. J., Lawrenceville—Lawrence Twp., Twp. Hall, penetration macadam on macadam surfacing 4,155 sq. yd. Princeton Tpke., Sect. 4. B. F. Stratton, Broad St. Bank Bldg., Trenton, engr.

N. J., Newton—Bd. Freeholders Sussex Co., Court House, bituminous penetration macadam on macadam surfacing 5,867 sq. yd. Trinity St. H. Snook, Court House, engr.

N. J., Shamong—Shamong Twp., gravel (calcium chloride) surfacing 11,555 sq. yd. Pipers Corner Rd., Sect. 2. Shedwick & Wills, 212 Smith-Austermuhl Bldg., Camden, engrs.

†Utah, Ogden—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., street and sidewalks, Hill Field. Over $25,000.

Bids on or about August 6

†Oklahoma—U. S. Eng., Tulsa, grading, utilities, operators quarters, service building, Great Salt Plains Dam.

Bids Asked August 7

New Hampshire—State Hy. Dpt., Concord, 3 in. road mix on gravel surfacing 1.483 mi. Pemigenarset Valley Rd., Merrimack Co. $112,000. J. O. Norton, Concord, engr.

N. Y., New York—President Bronx Boro, Bronx County Bldg., 851 Grand Concourse, sewer appurtenances, Hering Ave., sheet asphalt repaving Timpson Pl.; asphalt block repaving E. 140 St.; sheet asphalt repaving E. 181 St., brick repaving E. 181 St.

Virginia—Commonwealth of Virginia, Dpt. Hys., Richmond, concrete paving, bridge over Warwick River, 3.4 mi. Route 60, S.P. S-356-FW2, GW1, AW1, B1W, Warwick Co.; rein.-con. paving 0.5 mi. Route 1, S.P. S-398-AR1, W1, Mecklenburg Co.; waterbound macadam paving, bridging, etc., 2.7 mi. Route 29, S.P. SN-FAP-577-CW1; 614-AW2, B1W, Fed. Proj. SN-FAP-86-(3), SN-FAP-25-(3), Pittsylvania Co.; 182 ft. bridge, Route 71SP S-1196-B2, Scott Co.; concrete, stabilized base, S.T. surfacing 1.8 mi. Route 146 and 5, SP S-1221-DE1, M1, Henrico Co.

Bids Asked August 8

Kansas—State Hy. Dpt. at office Co. Clk., Lawrence, single asphalt surface treatment 3.499 mi. K1539 Atchison Co.; 9.702 mi. K1546 ABC; 9.311 mi. K1545 AB, both Nemaha Co.; 9.449 mi. K1544; 10.957 mi. K1592, Jefferson Co.; resurfacing material 5.16 mi. K1538 Wabaunsee Co.; 8.972 mi. K1537 Riley Co.; 4.904 mi. K1540 Brown Co.; 14.135 mi. K1541 Doniphan Co.; 16.105 mi. K1549, Leavenworth Co.; 3.79 mi. K1543 Marshall Co.; 18.34 mi. K1547; 5.417 K1548, both Pottawatomie Co.; grading, concrete paving 0.538 mi. FA 575 A, Wyandotte Co.; grading, concrete paving 0.366 mi. FA 273 H, Douglas Co.; light type surfacing 2.141 mi. K1129, Jefferson Co.

New York—A. W. Brandt, supt. P. Wks., Albany, imprv. hys., bridges Cattaraugus, Chautauqua, Suffolk and Westchester Counties; adv. ENR 7/31.

North Dakota—State Hy. Dpt., Bismarck, regrading, stabilized gravel base and bituminous surface treatment 18.196 mi. S.H.9, Case and Ransom Counties; roadside imprv. 5.866 mi. Hy.81 and S.H.13, Richland Co.; bituminous surface resealing 11.348 mi. U.S.Hy.83,

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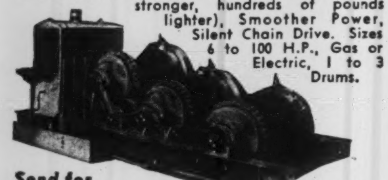

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STREETS, etc. (Bids Asked, Cont'd.)

Hazelton North, Emmons Co.; 13.196 mi. U.S. Hy. 83, Washburn North, McLean Co.

Pennsylvania—State Hy. Dpt., I. L. Hughes, secy., Harrisburg, bituminous on native stone or crushed aggregate surfacing, rein.-con. deck I-beam bridge over North Fork of Robinson Run, 2,340 ft. Legislative Route 681, Sect. 2, Traffic Route 978, North Fayette Twp., Oakdale Boro, Allegheny Co.; bituminous on native stone or crushed aggregate surfacing 1,187 ft. Legislative Route 598, Sect. 1-B, Traffic Route 127, bridge over Allegheny River, Harmony and Hickory Twps., Forest Co.; bituminous surfacing 4,989 ft. Legislative Routes 4, Sect. 16, 170, Sect. 16, 169 Sect. 13, Traffic Routes 72,115 and 309, Wilkes-Barre, Luzerne Co.; vitr. brick on concrete surfacing 1,477 ft. Legislative Route 238, Sect. 13, Traffic Route 518, Sharon, Mercer Co.; 4,676 ft. Legislative Route 257, Sect. 3-W, Traffic Route 22, Washington Co. T. C. Frame, co. owner, engr.

Vermont—State Hy. Dpt., H. E. Sargent, ch. engr., Montpelier, mixed in place surface course with cutback asphalt and refined tar on 7.757 mi. FAP 70 A' (2), 70 B (2), 704 (2), 70 D (2), 70 E (2) and 263 (2) in St. Johnsbury and Waterford. $150,000.

Bids Asked August 12

★**Ohio**—State Hy. Dpt., Columbus, brick paving and asphaltic concrete surfacing 0.393 mi. Sect. Minerva, SH 369, Carroll Co., Sect. Minerva, SH 78, Stark Co., $21,100; grading, asphaltic concrete paving 1.052 mi. Sect. Parma, SH 553, Cuyahoga Co., $22,400; grading, drainage structures, surface treated waterbound macadam paving 2.444 mi. Sect. G, SH 341, Holmes Co., $103,400; widening, asphaltic concrete resurfacing 2.125 mi., Sect. B-2 of SH 337, Sect. Mt. Vernon, SH 24 and 339, Knox Co., $31,300; grading, drainage structures, bituminous macadam, premixed widening, cold-mixed cold-laid asphaltic concrete resurfacing, building box culvert, 3.091 mi. Sect. A, SH 516, Mahoning Co., $64,900; 0.331 mi. grading, drainage structures, surface treated stabilized material paving, build-concrete beam bridge, concrete substructures over Kokosing River, Sects. D and Chesterville SH 693, Morrow Co., $63,500; 0.662 mi. grading, drainage structures, asphaltic concrete on stabilized material paving, continuous concrete slab bridge, concrete substructure over Dry Run, Ross Co., $42,600; grading, drainage structures, placing new base, widening, surfacing existing pavement and asphaltic concrete surfacing 1.278 mi. Sect. South Point, M-3, SH 7, US 52, Lawrence Co., $52,000; 1.677 mi. Sect. Grafton SH 341, and Sect. Oberlin SH 586, Lorain Co., $34,500; bituminous road mix resurfacing 7.279 mi., Sect. R, S, of SH 12, Portage Co., $33,200; bituminous treatment 41.03 mi. sections SH 257, 452, 256, 125, 494, 972, and 8, Clermont Co., $31,845; 37.98 mi., sections SH 50, 1, 453, 546, 814, and 49, Delaware and Franklin Counties, $18,801; 9.85 mi. Sects. K, G, G-1, and F of SH 349, Coshocton and Muskingum Cos., $22,655; 43.51 mi., sections SH 288, 521, 646, 97, 149, 267, 272, 292, and 455, Erie and Huron Counties, $66,442; 22.94 mi. sections SH 898, 717, 310, 51, 591, Henry Co., $27,891; 70.41 mi., sections SH 101, 102, 103, 104, 106, 295, 380, Belmont, Harrison and Jefferson Counties, $79,774; 26.52 mi., sections SH 890, 466, 90, 930, 34, 36, 555, 604, Cuyahoga and Lake Counties, $32,729; 37.06 mi. sections SH 123, 260, 459, 473, 124, 8, Highland, Pike and Ross Counties, $20,607; 54.85 mi. sections SH 341, 342, 527, 588, 676, 376, 408, 409, 413, 547, 720, Holmes and Tuscarawas Counties, $46,953; 8.8 mi., Sects. H, I, J, of SH 600, Knox and Licking Counties, $20,691; 7.6 mi., Sects. A, B, C, D, of SH 600, Licking Co., $9,644; 35.48 mi. sections SH 36, 144, 290, 291, 97, 314, 544, 321, Lorain and Medina Counties, $37,576; 27.27 mi. sections SH 307, 305, 309, 310, 717, Williams Co., $31,827; 5x9 ft. concrete slab top culvert Sect. B-2 of SH 337, Hancock Co., $2,700.

South Dakota—State Hy. Comn., Pierre, grading 8.882 mi. FAP 95 E(1); 0.569 mi. FAGM 95 F (1) both Spink Co.; 11.233 mi. FAGH 459 A (1) McCook Co.; 9.377 mi. FAGH 459 B (1) Hanson Co.; bituminous surfacing 6.495 mi. FAP 353 A (2) 353 B (2) Lawrence Co.; base course and seal 2.231 mi. FLHP 9(1) Todd Co.; 8.952 mi. FAP 78 (5) Tripp Co.; 17.482 mi. FAP SN 127 (3) 154 (3) SN452 A (2) Potter, Sully and Hughes Counties; 14.107 mi. FAP 173 E (4) and 194 A (3); 3.989 mi. FAP 173 F (3) both Hand Co.; 10.538 mi. FAP 237 E (2) Todd Co.; base course 12.043 mi. FAP 123 A (3) and SN 163 A (5), Butte and Lawrence Counties; guardrail 8.97 mi. FAP 78 (4) Tripp Co.; 17.34 mi. FAP SN 117 (2) Haakon Co.; 12.381 mi. FAP 173 E (3) Hand Co.; 15.465 mi. FAP 181 A (2) and 181 E (6) Potter and Dewey Counties; 18.847 mi. FAP SN 193 B (2) Deuel Co.; 12.774 mi. FAP 237 E (1) Todd Co.; 3.547 mi. SN FAGH 447 A (1) Pennington Co.; 34.201 mi. SN FAGH 452 B (1) FAP SN 452 A (1) SN 452 C (1) Potter, Sully and Hughes Counties.

Bids Asked August 20

†**Alabama**—Public Roads Administration, 305 Medical Arts Bldg., Florence, soft sandstone base course with gravel surfacing, bituminous treatment 5.087 mi. Alabama Forest Hy. Project 10-A, Black Warrior Natl. Forest, Winston Co.; adv. ENR 7/31.

Louisiana—State Dpt. Hys., Baton Rouge, W. P. Foster, dir., concrete paving 3.921 mi. S.P. 913-04-39, Amoretti-Freeport Hy., State Route 31, Plaquemines Parish; [illegible] and hauling 9,542 cu. yd. pit run gravel, S.P. 901-00-47, Red River Parish.

BIDS ASKED

†**California**—Con. Q.M., Fort Mason, San Francisco, paving, sidewalks Fort Cronkhite, Funston and Miley Inv. W-6616-42-7.

California—C. H. Purcell, engr. State Hy. Dpt., P. Wks., Bldg., Sacramento, rejected bids July 2, concrete and asphaltic concrete widening 10.4 mi. between San Pablo Creek and Carquinez Bridge, Contra Costa Counties CD 7/9—ENR 7/17.

Calif., Hanford—Supervs. Kings Co., widening, asphaltic concrete resurfacing 14 and Excelsior Aves. J. R. Hayes, Hanford, co. surv.

New Mexico—B. G. Dwyre, engr. State Hy. Dpt., Santa Fe, rejected bids July 17, imprv. Colfex Co. $130,626. CD 7/22—ENR 7/24, under CA.

Texas—D. C. Greer, engr. State Hy. Dpt. Austin, will not receive bids July 29, imprv. 4.561 mi. Hy. 146, Chambers Co. CD 7/24.

Tex., Longview—City, c/o W. Morgan Works, mgr., received no bids July 17, grading, draining, concrete paving $90,000. CD 7/8—ENR 7/10.

LOW BIDDERS

★**Alabama**—State Hy. Dpt., Montgomery, July 18, imprv. 18.374 mi. Clay and Coosa Counties, from R. T. Smith, 215 Atlanta Ave., Atlanta, Ga., **$541,597.** CD 7/10.

Arizona—State Hy. Comm., Phoenix, imprv. 39 mi. Navajo Co.; from N. G. Hill & Co., Route 6, Box 551, Phoenix, **$47,697.** CD 7/8.

California—C. H. Purcell, engr. State Hy. Dpt., Sacramento, July 16, imprv. 34 mi. hys. El Dorado, Yuba, Nevada and Placer Counties, from Hemstreet & Bell, P. O. Box 906, Marysville, **$27,349*****2.4 mi. Mendocino Co., from C. C. Wood, P. O. Box 599, Lodi, **$25,461*****8.5 mi. Mono Co. and 3.4 mi. Inyo Co., from Basich Bros. Constr. Co., 20,550 Normandie Ave., Torrance, **$117,858** and **$61,740** respectively. CD 6/30—ENR 7/3.

California—C. H. Purcell, engr. State Hy. Dpt., Sacramento, July 23, imprv. 1.7 mi. Solano and Napa Counties, from Heafey-Moore & Frederickson & Watson Constr. Co., 873-81 Ave., Oakland, **$128,157*****6.3 mi. Sonema and Napa Counties, from E. A. Forde, 640 Sir Francis Drake Blvd., San Anselmo, **$88,237*****50 mi. Butte, Yuba, Colusa, Sutter, Yolo and Glenn Counties, from Hemstreet & Bell, P. O. Box 906, Marysville, **$32,224.** CD 7/9.

†**California**—Public Roads Administration, Federal Office Bldg., San Francisco, July 24, imprv. 2.66 mi. El Dorado Co., from Johnston Rock Co., Weber Ave. and E. St., Stockton, **$305,452.** CD 7/9.

Calif., Alameda—City, July 19, imprv. 218,000 sq. ft. Encinal Ave., from Heafey-Moore Co., 344 High St., Oakland, **$59,971.** CD 7/9.

Louisiana—State Hy. Dpt., Baton Rouge, July 23, imprv. 23 mi. S.P. 913-04-64, St. Tammany Parish, from R. B. Tyler Co., 1446 Levering St., Louisville, Ky., **$29,691;** 5.765 mi. Verno Parish, from T. L. James & Co., Inc., Ruston, **$214,828.** CD 7/9—ENR 7/17.

Maryland—State Roads Comn., Baltimore, July 22, imprv. 2.6 mi. Worcester Co., from Hannaman Burroughs Co., Salisbury **$29,880;** 0.44 mi. Montgomery Co., from P. Reddington & Sons, 2 E. Lexington Sts., **$113,097.** CD 7/14—ENR 7/17.

★**Missouri**—State Hy. Comn., Jefferson City, July 25, hauling, dumping, etc., crushed stone 132.1 mi. hys. Clariton, Linn, Macon and Randolph Counties, from M. Baker, 1102 5 Ave. N.E., Independence, **$33,874*****76.1 mi. Cass Co., from Concrete Materials & Constr. Co., 405 Granby Bldg., Cedar Rapids, Ia., **$25,038***** imprv. 3.484 mi. and 3.963 mi. Christian Co., from Neyer Constr. Co., Billings, **$65,858** and **$80,565** respectively***4.283 mi. and 4.162 mi. Ray Co., from Koss Constr. Co., 205 Colony Bldg., Des Moines, Ia., and George Bennett Constr. Co., 901 N. 3 St., Kansas City, Kan., **$158,833** and **$187,745** respectively***2.718 mi. Randolph Co. and 4.166 mi. Ray Co., from Cameron Joyce & Co., Keokuk, Ia., **$126,447** and **$177,931** respectively***1.802 mi. Randolph Co. and 4.828 mi. Randolph Co., from Koss Constr. Co., 205 Old Colony Bldg., Des Moines, Ia., **$94,511** and **$220,044** respectively. CD 7/15—ENR 7/17.

Nebraska — State Dpt. Road & Irrigation, Lincoln, July 17, imprv. 14.4 mi. Ord-Burwell Rd. and 0.2 mi. Tekamah-Decatur Rd., from Peter Kiewit Sons Co., Omaha Natl. Bank Bldg., Omaha, **$36,201** and **$67,634** respectively***7.1 mi. Hebron-Nelson Rd., from W. A. Biba Eng. Co., Geneva, **$33,696*****9.4 mi. Hebron-Gilead Rd., from Steele Bros., Dorchester, **$42,585*****3 mi. Ogallala-Arthur Rd., from Roberts Constr. Co., 1018 Terminal Bldg., Lincoln, **$25,242.** CD 7/9.

N. J., West New York—Town, July 22, rein.-con. paving 9,900 sq. yd. Park Ave., Sect. 1, from Union City to Guttenberg, from N. J. Asphalt & Paving Co., foot of Howell St., Jersey City, **$56,513.** CD 7/18.

STREETS, etc. (Low Bidders, Cont'd.)

N. Y., New York—Comr. Parks, at Office Dpt. Parks, Arsenal Bldg., Central Park, 64 St. and 5 Ave., July 21, imprv. East Dr., Central Park, Contr. M-10-141, Manhattan Boro. and Bronx Whitestone Parkway, Contr. 125-141, Queens Boro, from Frank Mascali & Sons, Inc., 4634 8 Ave. **$173,206.** CD 7/14—ENR 7/17.

Ohio—State Hy. Dpt., Columbus, July 22, imprv. 5.069 mi. Champaign Co., from Boyd & Cook Co., Gas & Electric Bldg., Dayton, **$54,398.** Est. $57,000. CD 7/11—ENR 7/17.

†Ore., Portland—U. S. Eng., 628 Pittock Blk., Portland, July 18, paving streets, driveways, Air Base, from A. J. Berry 1931 S.E. Larch St., **$47,551.** CD 7/9.

Wash., Seattle—City, July 17, concrete sidewalks, 4 Ave. S., from Northwest Constr. Co., 3950 6 Ave. N.W., **$33,947.** Est. $31,133. C. L. Wartelle, County-City Bldg., engr.

Wis., Milwaukee—A. H. Hempe, ch. clk., July 22, paving W. State St., from Milwaukee Constr. Co., 2808 N. Sherman Blvd., **$53,605.** CD 7/17.

CONTRACTS AWARDED

†Ark., Springdale—Farm Security Administration, Little Rock, roads, grading, sidewalks, installing sewers, waterworks, Migratory Labor Camp, to R. A. Hughes, Fayetteville, **$75,691.** Awarded 6/28.

Calif., San Francisco—Property Owners in portions of Marietta Dr., Reposa Way, grading, asphaltic concrete paving streets, to Eaton & Smith, 715 Ocean Ave. **$29,851.**

Calif., San Luis Obispo—Curbing, guttering, etc., streets, to Brown, Doko & Baun, Pismo Beach, **$26,400.** Bids 7/14. CD 6/30—ENR 7/3.

Calif., San Mateo—To Union Paving Co., 310 California St., San Francisco, imprv. area between 27 and 31 Aves., El Camino Real and Alamada de Las Pulgas, **$104,463;** imprv. in Alameda de Las Pulgas, etc., **$27,586;** 37, 38 Aves., etc., **$68,871.** Grand total $200,920. Bids 7/21. CD 7/17.

Conn., Hartford—Bd. Contr. & Supply, 550 Main St., imprv. 21,000 sq. yd. Farmington Ave. from Asylum to Woodland Sts., to E. Balf Co., 171 State St., **$26,250.** Bids 7/22. CD 7/16.

Ia., Anamosa—Jones Co., surfacing 52 mi. roads to Myron Baker, Independence, **$25,836.**

Ia., Jefferson—Greene Co., L. English, aud., grading roads, to W. Lindhart, Jefferson. **$26,810.** C. A. Elliott, Jefferson, co. engr.

Kan., Hutchinson—T. C. Smith, city clk., asphalt paving, repaving, patching, 40 streets, to J. H. Shears & Sons, 410 E. 2 St., **$77,702.** Est. $78,610. Bids 7/18.

Kentucky—State Hy. Dpt., Frankfort, imprv. 6.42 mi. Pendleton Co., to O. V. Arnett, Berea, **$227,744;** 3.825 mi. Perry Co., to H. C. Adams, Lexington, **$46,430.** Bids 7/18. CD 7/1.

Massachusetts—Dpt. P. Wks., Boston, penolithic surfacing 104,100 sq. yd. FAP 139 B (3), Brimfield, to Bronx Water Wks., 1 Riverdale Ave., New York. **$453,886.** Est. $350,000. CD 5/20—ENR 5/22.

Mississippi—State Hy. Comn., Jackson, imprv. 1.192 mi. Perry Co., to Vincennes Steel Corp., Vincennes, Ind., **$107,699;** 0.852 mi. Grenada Co., to E. W. Hable, Corsicana, Tex., **$119,879.** Bids 7/22. CD 7/14.

Missouri—State Hy. Comn., Jefferson City, imprv. 3.795 mi. Pike Co., to Illinois Valley Constr. Co., Ottawa, Ill., **$73,970.** Bids 6/27. CD 7/1—ENR 7/10, under LB.

Montana—State Hy. Comn., Helena, imprv. 7.718 mi. Lewis and Clark Co., T. Staunton, 422 5 St. N., Great Falls, **$76,161*****8.45 mi. Fallon Co. and 8.859 mi. and 4.109 mi. Judith Basin and Fergus Counties, to Stanly H. Arkwright, Inc., Blackstone Apartments, Great Falls, **$80,678** and **$97,644** respectively***2.279 mi. Jefferson Co., to Union Constr. Co., 11 Ave. and 11 St. N., Great Falls, **$52,054*****3.66 mi. Sanders Co., to J. W. Merz, Inc., Helena, **$63,179*****1.366 mi. Lincoln Co., to Kirkpatrick Bros., Kalispell, **$25,996*****2.104 mi. Glacier Co., to F. J. Haas, 512 19 St. N.W., Great Falls, **$47,721.** Grand total $443,433. Bids 7/22.

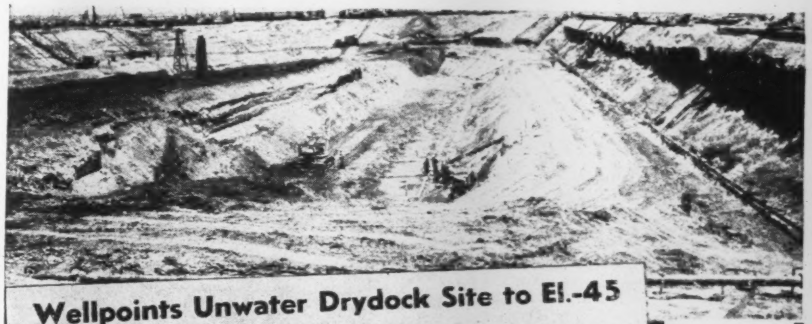
Nevada—State Hy. Dpt., Carson City, imprv. 6.31 mi. Lincoln Co., to Dodge Constr. Co., Inc., Fallon, **$59,523;** 5.04 mi. Nye Co., to Nevada Rock & Sand Co., P. O. Box 1626, Reno, **$32,747.** Bids 7/16. CD 7/8—ENR 7/10.

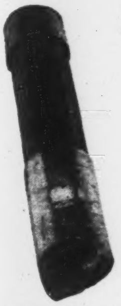
Nev., Sparks—Asphalt surfacing streets, to Isbell Constr. Co., P. O. Box 2351, Reno, **$30,748.**

New Jersey—Dpt. Conservation & Development, State House, Trenton, grading, ditches, 6 in. gravel fire roads, Camden Co. **WPA. $54,000.** G. R. Swinton, 930 Atlantic Ave., Atlantic City, owner's and WPA engr.

N. J., Bayonne—Grading, bituminous surfacing, **WPA. $61,500.** C. Malstrom, Orange and 6 Sts., Newark, owner and WPA engr.

N. J., Bayonne—Grading, removing old granite block surfaces and bituminous resurfacing streets, **WPA. $55,000.** C. Malstrom, Orange and N. 6 St., Newark, WPA and owner's engr.





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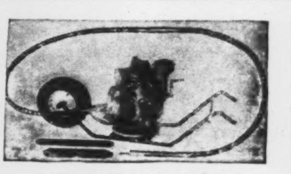

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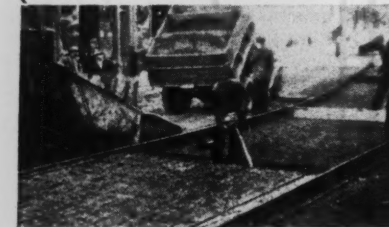

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STREETS, etc. (Contracts Awarded, Cont'd.)

†N. J., Clark—Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., grading, bituminous penetration macadam fdn. and paving 21,500 cu. yd. streets. **WPA. $52,500.** J. H. Weitzen, Smith and Hobart Sts., Perth Amboy, WPA and owner's engr.

N. J., East Orange—Grading, paving streets, **WPA. $57,000.** C. Malstrom, Orange and N. 6 Sts., Newark, WPA and owner's engr.

N. J., Hackensack—Bergen Co., Administration Bldg., grading, 6 in. penetration macadam pavements. **WPA. $58,800.** J. H. Sheehan, foot of 5 Ave., Paterson, owner's and WPA engr.

N. J., Hammonton—Mullica Twp. and town of Hammonton, grading, gravel surfacing, **WPA. $66,574.** G. R. Swinton, 930 Atlantic Ave., Atlantic City, WPA and owner's engr.

N. J., Montclair—Grading, 3 in. penetration macadam surfacing, **WPA. $62,700.** J. B. Hayden, Town Hall, town and WPA engr.

N. J., Mt. Holly to **South Pemberton**—Burlington Co., Court House, Mt. Holly, grading, 6 in. gravel and 3 in. top surfacing 5.5 mi., Mt. Holly-S. Pemberton Rd. **WPA. $140,653.** W. D. Cougle, 1102 S. Broad St., Trenton, WPA and owner's engr.

N. J., Newark—Grading, 3 in. penetration on 6 in. concrete surfacing, resetting curbs, catch basins, etc., **WPA. $60,500.** George Andress, City Hall, owner's and WPA engr.

N. J., Secaucus—Grating, paving, imprv. streets, to N. J. Asphalt & Paving Co., foot of Howell St., Jersey City, **$42,224.**

N. J., Washington—Rein.-con. paving 10,200 sq. yd. Broad St. from Square to Boro line, to Korp & Korp, 611 5 Main St., Phillipsburg, **$36,712.** H. W. Vetter, Belvidere, engr.

†N. Y., Fort Hamilton—Con. Q.M., 120 Wall St., New York, constructing road, to South Shore Constr. & Dredging Corp., 100 West Ave., Patchogue, **$34,586.**

N. Y., New York — President Manhattan Boro, Municipal Bldg., repaving, recurbing 60 St., various locations. **WPA. $167,360.** W. W. Johnston, 70 Columbus Ave., dir. Div. Operations.

N. Y., New York—Dpt. P. Wks., Municipal Bldg., paving, reconstructing on 145 St. bridge over Harlem River. **WPA. $56,178.** W. W. Johnston, 70 Columbus Ave., dir. Div. Operations.

N. Y., New York — President Manhattan Boro, Municipal Bldg., restoring pavement, WPA street openings, various locations. **WPA. $251,735.** W. W. Johnston, 70 Columbus Ave., dir. Div. Operations.

N. Y., New York — Dpt. P. Wks., Municipal Bldg., New York, widening roadway, Brooklyn Plaza, Manhattan Bridge. **WPA. $65,713.** W. W. Johnston, 70 Columbus Ave., New York, dir. Div. Operations.

N. Y., St. George—President, Richmond Boro, Boro Hall, repaving on concrete fdns. **WPA. $73,081.** W. W. Johnston, 70 Columbus Ave., New York, dir. Div. Operations.

North Dakota—State Hy. Dpt., Bismarck, July 25, landscaping, gravel shoulders, road imprv. 6.9 mi. SN-FAP 137 A (2), SN-FAP 137 A (3) Cass Co., to Northern Imprv. Co., Fargo, **$58,400*****regrading, road imprv. 8.5 mi. FAP 293 B (3), Walsh Co., to W. H. Noel Co., Jamestown, **$44,428.** Rejected bids 7/25, bituminous sealcoat road imprv. 11.9 mi. FAP 166 (8) and 110 (3), Walsh and Grand Forks Counties; guard rail road imprv. McLean, Williams, Mountrail, Burleigh and Richland Counties.

Ohio—State Hy. Dpt., Columbus, imprv. 27.99 mi. Geauga and Lake Counties, to Northeastern Road Imprvt. Co., Willoughby **$38,889,** est. $39,031***35.25 mi. Crawford and Richland Counties, to C. E. Edgington & Sons, 1220 S. Main St., Findlay **$15,678,** est. $49,901***70.74 mi. Coshocton, Knox and Licking Counties, and 47.8 mi. Ashland Medina and Wayne Counties, to Ohio Road Imprvt. Co., 30 E. Broad St., Columbus **$59,113** and **$72,273** respectively, est. $61,967 and $72,408 respectively***43.93 mi. Coshocton, Guernsey and Muskingum Counties, to C. J. Shelly, Thornville, **$34,887,** est. $36,985***31.06 mi. Ashtabula Co., to Mahoning Contg. Co., 616 Porter St. N.E., Warren **$44,889,** est. $44,947***1.293 mi. VanWert Co., to S. E. Johnson, 218 Terminal Bldg., Toledo **$29,679,** est. $30,700. Grand total $325,408. Bids 7/22. Rejected bids July 22, imprv. 0.56 mi. Ashland Co. $10,650; received no bids July 22, imprv. 9.144 mi. Holmes Co. $39,800 and 0.635 mi. Warren Co. $8,220. CD 7/11—ENR 7/17.

O., Cincinnati—Imprv., relocating section Burns Ave. connection with proposed B. & O. R. R. grade elimination project, to Foley Constr. Co., Boudinot Ave., and B. & O. R. R. **$28,355.** Est. $33,945. Bids 7/1.

Oregon—State Hy. Comm., Salem, imprv. 2.09 mi. Benton Co. and 5.39 mi. Grant Co., to E. L. Gates, Packwood, Wash., **$43,470** and **$47,915** respectively***0.52 mi. Clatsop Co., to Porter Wyett, 6500 N.E. Ainsworth St., Portland, **$34,497*****2.84 mi. Lake Co., to Rogers Constr. Co., Dayton, Wash., **$52,961*****Linn and Marion Counties, to A. O. Ekstrom, 1266 N.E. Wheeler St., Portland, **$35,500*****0.44 mi. Front Ave., Portland, to Edlefson-Weygandt, 9233 N. Calvert St., Portland, **$244,940.** Grand total $459,283. Bids 7/17. Received no bids 7/17, imprv. 1.26 mi. Lane Co.; rejected bids 7/17, imprv. 5.4 mi. Harney Co. CD 7/9.

Oregon—State Hy. Comm., Portland, imprv. 2.22 mi. Union Co., to E. L. Gates, Packwood, Wash., **$30,920.** Bids 7/17. CD 7/9.

Pa., Somerset—Boro Council, stone and bituminous material resurfacing streets, to Baumgardner Resurfacing Co., Windber. Est **$25,000.**

R. I., Cranston—Bd. Contr. & Purchase, City Hall, imprv. 4,000 ft. Laurel Hill Ave., to Campanella & Cardi Constr. Co., 86 Weybosset St., Providence, **$62,431;** 750 ft. Rolfe St., to J. Ambrose Constr. Co., 1090 Pontiac Ave., Providence, **$35,852.** CD 7/22—ENR 7/24.

Tenn., Paris—Imprv. streets, **WPA. $50,000.** C. E. Snyder, Paris, engr.

Vermont—State Hy. Dpt., Montpelier, crushed gravel mixed in place surface course with refined tar, 1,454 mi. hy., Jay to Lambert & George, 64 Main St., Montpelier, **$176,260.** Bids 7/11, awarded 7/23. CD 7/2.

Vermont—State Hy. Dpt., Montpelier, 1.84 mi. grading, double tack coat refined tar surfacing and 2 span, 108 ft. bridge, SN-FAP 109 G(1), Leicester and Salisbury, to Bristol Contg. Co., Inc., Lake St., Bristol, N. H. **$129,863.** Bids 6/27. CD 6/18.

West Virginia—State Roads Comm., Charleston, imprv. Mingo Co., to Middle States Bit. Corp., Ironton, O., **$46,947.** Bids 7/22. CD 7/14—ENR 7/17.

Wyo., Laramie—S. E. Walter, mayor, sidewalks, curbing, guttering, road imprvs., **WPA. $57,000.**

British Columbia—Dpt. P. Wks., Victoria, to Carter-Halls-Aldinger Co. Ltd., 670 Taylor St., Vancouver, surfacing highway, Sect. 1, Vancouver Island, **$27,191*****to E. R. Taylor Constr. Co., Ltd., 8699 Hudson St., Vancouver, Sect. 2, Lower Mainland, **$41,414*****to Columbia Bitulithic Ltd., Granville Island, Vancouver, Sect. 3, Kamloops, Lilooet and Yale, **$36,971*****to Dawson Wade & Co., Ltd., 775 Clark St., Vancouver, Sect. 4, Okanagan, **$39,102;** reconstructing 2.15 mi. Malahat Hy. **$148,014;** 4.5 mi. Squamish-Britannia Rd. and 7.65 mi. to Britannia, **$43,515*****to W. C. Arnett & Co., Ltd., 985 E. Hastings St., Vancouver, mile 10.8 to 14.77 Northern Transprovincial Hy., Usk-Cedarville sect., **$50,000*****to General Constr. Co. Ltd., Granville Island, Vancouver, mile 1.39 to mile 4.52 south of Golden, Kootenay-Columbia Hy., **$31,898.** Grand total $418,105.

N. B., Moncton—Permanent paving Harris and Broadview Aves., Maple and John Sts., Givan Dr., to Wheaton Bros. Ltd., Downing St., est about **$35,000.** E. B. Martin, City Hall, engr.

N. S., Donkin—Providence of Nova Scotia, Halifax, road reconstruction 2 mi. near Glace Bay, day labor. **$50,000.** Dpt. Hys., Halifax, engrs.

Ont., Petawawa—Dpt. National Defense, Ottawa, surfacing road, in camp area, to M. G. Henninger, Smith Falls, **$50,000.**

Ont., Camp Borden—Dpt. National Defense, Ottawa, surfacing Parade Ground, to Municipal Road Spraying & Oiling Co., Ltd., 225 Sterling Rd., Toronto. **$32,000.**

Ont., Toronto—Asphaltic concrete paving Van Horne St. from Ossington Ave. to Westmoreland Ave., to Kilmer Van Nostrand & Co. Ltd., 315 Eglinton Ave., W., **$39,448;** Van Horne St. from Westmoreland Ave. to Dufferin St., to Godson Contg. Co., Ltd., 203 Richmond St. W., **$39,755.**

Ont., Windsor—Essex Co. Roads Dpt., 3255 Sandwich St. W., imprv. 2.5 mi. roads, to Municipal Road Spraying & Oiling Co., Ltd., 225 Sterling Rd., about **$30,000.** Bids 6/30. CD 6/24.

Quebec—Deputy Minister Dpt. Roads, Quebec City, imprv. 14.4 mi. hy. New York State-Montreal Hy., St. Hyacinthe to Ste. Helene de Bagot, to Cormier, Ltd., 175 Alexander St., Three Rivers, **$191,829;** 11.3 mi. same hy. Ste. Helene de Bagot to Drummondville, to C. Gagnon, Neuville, **$127,550.** Bids 7/16. CD 7/10.

Quebec — Dpt. Roads, Quebec City, bituminous paving 8 mi. St. Simon-St. Fabien Rd. Route 10, to Provincial Constr. Co., Ltd., 2750 Hill Park Rd., Montreal, **$48,000.**

EARTHWORK, WATERWAYS

PROPOSED WORK

†Calif., Pleasanton—Soil Conservation Serv. Dpt. Agriculture, 2288 Fulton St., Berkeley, completing plans 1½ story bare root drying and cleaning plant. H. F. Genss, 2249 Ward St., Berkeley, archt.

Ia., Davenport—Scott Co., reparing drainage ditch. Dist. 3, Butler Twp. $15,000.

Ia., Iowa City—G. C. Watson, city clk., flood control on Ralston Creek. $15,000. W. J. Buchele, city engr.

N. J., Atlantic City—Atlantic Co., Court House, excavating, grading banks, etc., stream clearance in various streams. $40,000. WPA. G. R. Swinton, 930 Atlantic Ave., WPA and owner's engr.

N. J., Clifton—Excavating, grading banks, etc., eliminating flood control along Weasel Brook, $63,761. WPA. J. F. Sheehan, foot of 5 Ave., Paterson, WPA and owner's engr.

EARTH WORK, etc. (Proposed Work, Cont'd.)

N. J., Dover—Morris Co., Court House, excavating, widening, deepening Green Pond Brook near Picatinny Arsenal. $60,839. WPA. J. F. Sheehan, foot of 5 Ave., Paterson, WPA and owner's engr.

N. J., East Orange—Excavating, grading, rein.-con. floor in 2nd River for flood control. $68,973. WPA. W. Willegarod, Town Hall, town and WPA engr. CD 7/16—ENR 7/24.

†Oregon and **Washington**—U. S. Eng., Pittock Blk., Portland, Ore., dredging Columbia River and tributaries above Celilo Falls to mouth of Snake River. $50,000.

Pa., Wilkes-Barre—L. K. Eldridge, city clk., City Hall, dredging creek, erecting embankments from Central R.R. of N. J. tracks to Plains Twp. line. Over $20,000. G. B. Walker, city engr.

★**Tenn., Union City**—State Reelfoot Lake Comn., Nashville, P. Cooper, gov., dredging, etc. Reelfoot Lake. $500,000.

★**†Tex., Denison**—U. S. Eng., Citizens Bank Bldg., doubling original capacity Red River (Denison) power dam, about 70,000 kw. $18,000,000.

★**Tex., El Paso**—El Paso County Water Control & Imprvt. Dist., El Paso, water control and imprv. work, ditching, drainage, levees, etc. $700,000. Bond election soon.

★**Tex., Houston**—6,500,000,000 cu. ft. earthen dam on San Jacinto River. $3,000,000. Plan financing through PWA. G. L. Fugate, Houston, municipal water engr.

Tex., Houston—Denver Harbor addn. drainage project. $425,000.

★**†Tex., San Benito**—International Boundary Comm., J. L. Lytle, project engr., Farmers Bank Bldg., San Benito, flood control power and irrigation work, inlet canal, Los Olmos reservoir, Los Olmos hydro electric plant, 30 mi. feeder canal, 67 mi. distr. canal, supplemental storage dams, $65,000,000. E. N. Noyes, Tower Petroleum Bldg., Dallas, R. J. Cummins, Bankers Mortgage Bldg., Houston, and A. Tamm, Harlingen, consult. engrs. CD 11/7—ENR 11/14.

Tex., Victoria—Victoria Co., c/o Judge, Victoria, drainage. $35,455.

†Wash., Yakima—Bureau Reclamation, Yakima, bids early in August, distr. canals to irrigate, 8,000 acres land.

†Wash., Yakima — Bureau Reclamation, Yakima, bids early in September. 10 mi. Roza main canal.

BIDS ASKED

Bids Asked after July 25

†N. Y., Corning—U. S. Eng., Security Mutual Bldg., Binghamton, flood protection project, Sect. 2. CD 2/7—ENR 2/13.

Bids Asked August 5

Mass., Ware—Comn. of Mass., Dpt. P. Wks., H. L. MacDonald, comr., Boston, dredging 20,000 cu. yd. material Ware River. $15,000.

Bids Asked August 6

†Minn., St. Paul—U. S. Eng., Post Office and Custom House, St. Paul, imprv. Minnesota River channel for flood control.

Virginia—U. S. Eng., 1 and Douglas Sts. N. W., dredging 68,000 cu. yd., Hoskins Creek and 38,000 cu. yd. Little Wicomico River, Va.

Bids Asked August 7

†Arkansas—U. S. Eng., P. O. Box 60, Vicksburg, Miss., 1,270,000 cu. yd. earthwork on south bank Arkansas River.

†Rhode Island—U. S. Eng., 819 Industrial Trust Bldg., Providence, removing 730 cu. yd. ledge rock from Providence River and Harbor; adv. ENR 7/31.

Bids Asked August 8

California—State Engineer, Div. Water Resources, 401 P. Wks. Bldg., Sacramento, Proj. A, imprv., enlarging east levee of Sutter By-Pass and levees of Wadsworth Canal/or/alternate Proj. B, enlarging approx. 7 mi. of east levee of Sutter By-Pass between Gilsizer Slough and Liggle Blue Creek.

Bids Asked August 12

†Connecticut—U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., Meadow Hill pump. station, on east bank Connecticut River, East Hartford, adv. ENR 7/31.

Bids Asked August 13

†Maryland—U. S. Eng., 332 Post Office Bldg., Baltimore, dredging 119,000 cu. yd. material from Chesapeake Bay and Fishing Creek, Calvert Co., adv. ENR 7/21.

†Md., Baltimore—U. S. Eng., Baltimore, dredging 119,000 cu.yd. material from Chesapeake Bay and Fishing Creek.

†Pa., Pittsburgh—U. S. Eng., New Federal Bldg., Pittsburgh, reconstructing river wall, Monongahela River Lock 5.

Bids Asked August 15

†Connecticut—U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., dredging approx. 280,000 cu. yd. material in Stamford Harbor; adv. ENR 7/31.

★**†Wash., Port Angeles**—U. S. Eng., Central Bldg., Seattle, 8,200 ft. rubble-stone breakwater from Waadah Island to mainland at Neah Bay. $2,000,000. CD 6/3—ENR 6/5.

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EARTHWORK, etc. (Bids Asked, Cont'd.)

Bids Asked August 22

†New Jersey—U. S. Eng., 17 Battery Pl., New York, N. Y. dredging 466,300 cu.yd. material except ledge rock from Raritan River to Arthur Kill cut-off channel. Adv. ENR 7/31.

Bids Asked August 25

†La., Calumet—U. S. Eng., foot of Prytania St., New Orleans, 8 mooring pile clusters, in Intracoastal Waterway vicinity Wax Lake Outlet Navagation Crossover.

Bids Asked August 29

†Ind., Evansville—U. S. Eng., P. O. Box 59, Louisville, Ky., flood protection works, Howell Sect., Unit 1, Vanderburgh Co.; adv. ENR 7/31.

Bids Asked

†Calif., San Rapael—U. S. Eng., 401 Customhouse, San Francisco, dredging 98,179 cu.yd. San Rafael Creek, Inv. 868-42-20.

LOW BIDDERS

†Maryland—U. S. Eng., Post Office Bldg., Baltimore, July 14, dredging 68,500 cu. yd. Middle River and Dark Head Creek, from Hill Dredging Co., Ventnor, N. J. **$195,699.** CD 6/24—ENR 6/26.

★**Pa., Pittsburgh**—Comrs. Allegheny Co., July 22, Contr. 11, foundation walls for westbound roadway, Duquesne Way, from John F. Casey Co., Aspinwall, **$540,914.** CD 7/17.

★**†Washington**—Bureau Reclamation, Customhouse, Denver, Colo., July 15, 3 hydraulic turbines for Units L-4, L-5 and L-6, Grand Coulee dam power plant, from Newport News Shipbuilding & Drydock Co., Newport News, Va., Schedule 1, **$1,880,000;** Schedule 2, oil pressure governors, from Woodward Governor Co., Rockford, Ill., **$82,992.** CD 7/3.

CONTRACTS AWARDED

★**†Arizona-California**—Bureau Reclamation, Customhouse, Denver, Colo., generator and lightning arrester for Unit 4, Parker Power plant to Westinghouse Electric & Mfg. Co., G & E Bldg., Denver, Colo. **$367,700** and **$5,325** respectively***transformers, to Maloney Electric Co., St. Louis, Mo. **$102,900*****oil circuit breaker, to Kelman Electric & Mfg. Co., 1650 Naudain St., Los Angeles, Calif. **$26,125***** disconnecting switches, to General Electric Co., 1 River Rtd., Schenectady, N. Y. **$5,247.** Grand total $507,297. CD 6/3—ENR 6/5.

†Colorado—Bureau Reclamation, Customhouse, Denver, penstocks and outlet pipes for Green Mountain Dam, Colorado Big Thompson Project, to Thompson Pipe and Steel Co., 3001 Larimer St., Denver, **$216,485.** CD 5/20—ENR 5/22.

Ill., Mattoon—Riley Creek Drainage Dist., imprv. drainage storm water, **WPA. $65,000.**

★**†Ky., Jamestown**—U. S. Eng., Nashville, Tenn., Wolf Creek Dam, appurtenant works, to S. A. Healy Constr. Co., 14 Fishers Lane, White Plains, N. Y. **$15,803,890.** CD 7/14—ENR 7/17.

†Mass., Lowell—U. S. Eng., Park Square Bldg., Boston, flood control, 2 dikes and pump. stations, Merrimac River, to J. L. Washbourne, Inc., 274 Madison Ave., New York, N. Y. **$304,589.** CD 7/21—ENR 7/24, under LB.

N. J., Atlantic City—Atlantic Co., Court House, excavating, grading banks, stream clearance, various streams, **WPA. $35,000.** G. R. Swinton, 930 Atlantic Ave., Atlantic City, WPA and owner's engr. CD 6/23—ENR 6/26.

S. D., Brandon—Split Rock Lake Assn., rolled earth dam, control gate, concrete spillway, railroad embankment, **WPA. $235,000.**

Wyo., Torrington—Goshen Co. Irrigation Dist., Torrington, irrigation sys. imprvs., **WPA. $57,737.**

UNCLASSIFIED

PROPOSED WORK

★**†Ala., Mobile**—SHIPBUILDING PLANT—Alabama Dry Dock & Shipbuilding Co., Inc., Pinto Island, Mobile, plans construction plant, for Navy Dpt., $4,284,000 for buildings and facilities, $726,000 for machinery and equip. Total est. $5,010,000. Defense Plant Corp. will finance.

Calif., Inglewood—HANGAR—American Airlines, Union Air Terminal, Burbank, sketches by Taylor & Taylor, archts. and engrs., 803 W. 3 St., Los Angeles, 180x350 ft. hangar, 2 story office, Municipal Airport, Mines Field, Los Angeles. $350,000-$400,000.

Calif., Monterey—SWIMMING POOL—City Council, covered swimming pool. $150,000.

Calif., Newport Beach — PIER — J. G. Blindbury, 3908 Channel Pl., pier, mooring float, appurtenances, exten. 30 ft. into county channel.

Calif., Port Chicago — SHIPBUILDING YARD—Allied Eng. & Shipbuilding Co., 501 Commercial Exch. Bldg., Los Angeles, rehabilitating shipbuilding yard, new outfitting pier and rebuilding old machine shop, south side of Suisun Bay. $200,000.

Calif., Sacramento—RUNWAYS—Surveys 2 new runways, lighting sys. Sacramento airport. $400,000.

Calif., San Francisco—GYMNASIUM—City and San Francisco Co., rein.-con. gymnasium, Lincoln High School. $250,000. Municipal Bureau of Architecture, City Hall, archts.

†Calif., San Miguel—SPORTS ARENA—Con. Q.M., Camp Roberts, bids soon sports arena.

Calif., Wasco—SWIMMING POOL—Wasco Union High School Dist., Wasco, plans bond election swimming pool, high school campus. $46,000.

Calif., Woodland — AIRPORT — Yolo Co. plans special election to determine to levy direct tax or bond issue for airport development, 4 mi. south of here. $200,000.

Colo., Delta — AIRPORT — Delta Airport, Inc., Delta, S. Carrington, pres., airport, 3 new runways. $25,000.

Fla., Cross City—AIRPORT—Municipal airport. $250,000.

Fla., Jacksonville — AIRPORT — Municipal airport. $250,000.

★**Fla., Jacksonville**—SHIP REPAIRING and DRYDOCK PLANT — Chicago Bridge & Iron Co., 1305 W. 105 St., Chicago, Ill., ship repair and drydock plant, in or near here, incl. 2 floating drydocks. $1,500,000.

★**Ga., Roswell**—DAM, etc.—Georgia power Co., c/o P. Arkwright, 75 Marietta St. N.W., Atlanta, imprv. present dam and power plant to increase kw. hours up to 25,000. About $10,500,000.

Idaho, Coeur D' Alene—AIRPORT—Airport on 1½ sq. mi. site, Rathdrum prairie, for army use. $400,000. CAA.

Idaho, Priest River—DAM, etc.—Northern Idaho Rural Electrical Rehabilitation Assn., Priest River, rein.-con. dam and power house on Priest River at outlet of Priest Lake. $100,000. J. W. Cunningham, Spalding Bldg., Portland, Ore., engr.

Illinois — PIPE LINE — Illinois Natural Gas Co., Glenarm, 43 mi. pipeline to carry natural gas, from Peoria to Galesburg. F. Hamilton, Illinois Bldg., Springfield, engr.

★**Ia., Cedar Rapids**—AIRPORT—Airport, 640 acre tract site approved by civil Aeronautics Auth. $1,500,000. Will apply for federal funds.

Kan., Chanute—AIRPORT—B. M. Dunham, mayor, airport imprvs., runways, drainage, $55,000. $25,000 bond issue approved.

Kan., Kansas City—PUMPING STATION—Bd. P. Utilities, low service pump. station. Over $100,000. Burns & McDonnell, 107 W. Linwood Blvd., engrs.

†La., Lake Charles—HANGARS—U. S. Eng., foot of Prytania St., New Orleans, rejected bids July 15, 3 AC hangars for training fields, Advance Single-Engine School. CD 7/18—ENR 7/24.

Me., Portland—DOCKAGE FACILITIES—Canadian National Rys., 360 McGill St., Montreal, Que., H. A. Dixon, ch. engr. (oper.), rehabilitating dockage facilities. $100,000.

†Mass., Salem—RAMP—U. S. Coast Guard, Wash., D. C., rejected bids June 30, seaplane ramp, Winter Island. CD 5/29—ENR 6/5.

Mo., St. Louis—AIRPORT—President Bd. Pub. Serv., City Hall, surveys airport, runways, hangars, lighting and sewerage sys., etc. on 1,000 acre tract near confluence of Missouri and Mississippi Rivers.

Mo., St. Louis—ROLLER SKATING RINK—Missouri Press Brick & Imprvt. Co., H. C. Koenig, pres., 3411 Cook Ave., plans by Saum Architects, 713½ Chestnut St., and soon takes bids 1 story, 150x320 ft., roller skating rink building, south side Chippewa St., east of Kingshighway Blvd.; also bowling alley building, north side Chippewa St., east of Kingshighway Blvd.

Mo., St. Louis—SUPPLY DEPOT—Coast Guard, 815 Olive St., supply depot along river front between Holly Hills Ave. and Iron St. $120,000.

Neb., Grand Island—AIRPORT—H. S. Grimminger, mayor, airport imprvs., runways. $62,000.

Neb., Hastings — GAS DISTRIBUTION PLANT—Municipal gas distri. plant. $246,000. F. E. Devlin, W-K-H Bldg., Wichita, Kan., engr. CD 5/2—ENR 5/8.

Neb., North Platte — AIRPORT — $25,000 bond election August 19, airport imprvs., runway expansion. $65,000. CD 6/10—ENR 6/12.

Neb., Omaha—GAS REGULATOR STATION—Metropolitan Utilities Dist., 18 and Harney Sts., gas regulator station, near 27 and Q Sts. $41,000.

New Jersey — PARK IMPROVEMENTS — Camden Co., Court House, Camden, imprv. parks, retaining walls, paths, landscaping, etc. $60,500. G. R. Swinton, 930 Atlantic Ave., Atlantic City, WPA and owner's engr.

New Jersey—PARK IMPROVEMENTS—Essex Co. Park Comn., 115 Clifton Ave., Newark, excavating, grading, landscaping, etc., parks. $60,500. R. D. Crater, 115 Clifton Ave., Newark, co. and WPA engr.

N. J., Bayonne — PLAYGROUND — Playground with recreation fields, roads, etc. $129,949. WPA. C. Malstrom, Orange and N. 6 St., Newark, WPA and owner's engr.

†N. J., Fort Monmouth—LANDSCAPING—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., landscaping western part of cantonment, excavating, installing drainage sys. in post expansion area, $65,000. WPA. W. D. Cougle, 1102 S. Broad St., Trenton, WPA and owner's engr.

N. J., Newark—PARK IMPROVEMENTS—Essex Co. Park Comn., 115 Clifton Ave., imprv. parks, drainage, fences, paths, etc. $53,700. WPA. R. D. Crater, 115 Clifton Ave., owner and WPA engr.

UNCLASSIFIED (Proposed Work, Cont'd.)

N. J., Nutley—PARK IMPROVEMENTS—Imprv. park, excavating, grading, landscaping etc. $52,500. D. Shepherd, Town Hall, WPA and town engr.

New York—RURAL LIGHT SYSTEM, etc. —Otsego Electric Assn., Inc., Cooperstown, rural light and power distr. sys., various parts Otsego Co. Over $100,000.

N. Y., New York—GRANDSTANDS—Park Dpt., Arsenal Bldg., Central Park, 64 St. and 5 Ave., plans by A. Embury, 150 E. 61 St., 3 grandstands, St. Mary's St. and Jackson Ave. $27,500.

N. Y., Utica—AIRPORT—Dpt. P. Wks., City Hall, addnl. airport imprvs., grading, drainage sys., runways. $327,298. J. B. Shaw, city, engr.

★**N. C., Jacksonville** — PARACHUTE TROOPS TRAINING FACILITIES—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., parachute troops training facilities, clearing, grading, preparing area, 3 runways, gas storage, operation building, firstaid station, drainage, new Marine Base. $800,000.

N. C., Statesville — AIRPORT — J. Wesley Jones, mayor, voted $50,000 bonds, airport. $151,000.

N. D., Grand Forks — AIRPORT — Voted $50,000 bonds, airport imprvs., hangar, office, runway imprvs. $125,000. A. F. Hulteng, city engr. CD 6/11—ENR 6/26.

O., Coshocton—SWIMMING POOL—Swimming pool. $50,000. G. A. Stewart, city engr. CD 2/5—ENR 2/20.

★**†O., Dayton** — HANGAR — U. S. Eng., Wright Field, bids soon 200x400 ft., steel test hangar. $500,000. Structural steel awarded to Bethlehem Steel Co., Bethlehem, Pa. **$380,105.**

O., Toledo—AIRPORT IMPROVEMENTS—Plans by Mills, Rhines, Bellman & Nordhoff, 518 Jefferson Ave., administration bldg., Toledo Municipal Airport. $200,000. C. L. Piper, 4526 Eastway St., com. of engr.

O., Verona—GAS LINES—C. L. Reed, mayor, gas distr. lines. $75,000.

O., Youngstown—SWIMMING POOL—Municipal swimming pool for negroes. $65,000. Will apply for $45,000 WPA gr. R. W. O'Neill, city engr.

Oklahoma and **Texas**—OIL PIPELINE—Bell Oil & Gas Co., Grandfield, Okla., made plans 35 mi. 4 in. oil pipeline from Fargo Oil field, Texas to Grandfield, Okla. $45,000.

†Ore., Eugene—AIRPORT—U. S. Eng., 628 Pittock Blk., Portland, paving, completing runway to 4,000 ft., paving, exten. taxiways, grading, etc. $100,000.

Pa., Altoona—AIRPORT—M. Hunter, city councilman in charge, airport, Greenwood sect. Over $250,000. B. M. Schwab, city engr.

Pa., Johnstown — SWIMMING POOL — City Council, F. I. Connor, councilman in charge, municipal swimming pool, Roxbury Park. $25,000. H. Lee Wilson, city engr.

Pa., Marshburg (Custer City P. O.)—OIL DEVELOPMENT—Forest Oil Corp., Forest Oil Bldg., Bradford, development crude oil properties, drilling wells, water flood pressure plants, new gathering and connecting pipe line, steel tank storage facilities, water purification plants, near here. $60,000-$75,000.

Pa., York—AIRPORT—B. J. LaMotte, 233 W. Bway., Red Lion, airport on 30 acre site, along Lincoln Hy., east of here, incl. 1,000 ft. hard-surfaced runways, hangar, office, etc. $25,000.

S. C., Orangeburg — AERONAUTICS SCHOOL—Hawthorne School for Aeronautics, 8 bldgs., incl. barracks, hangar, administration bldg. H. Tatum, 34 Broad St., Charleston, archt.

Tex., Ballinger — AIRPORT BUILDINGS — F. Harmon, San Marcos, imprvs. and constructing training buildings for elementary aviation pilots. $110,000.

Tex., Bay City—RECREATION CENTER—Town, plans by Hedrick & Lindslay, c/o Union Natl. Bldg., Houston, recreation center. $166,450.

Tex., Brownwood—SWIMMING POOL, etc. —Plans by Wyatt C. Hedrick, 1005 1st Natl. Bank Bldg., Fort Worth, H. Mount, resident archt., Brownwood, concrete swimming pool, 4 story recreation building, athletic courts, grounds development. $115,200. PWA.

Tex., Coleman—AVIATION PILOT TRAINING BUILDINGS—Bonham Aviation School, Bonham, facilities for training aviation pilots. $100,000.

†Tex., Dallas — AVIATION BASE — U. S. Eng., Denison, reserve aviation base facilities. $145,000 or more.

Tex., Fort Worth—HANGAR—S. H. Bothwell, city mgr., hangar for Meacham Field, 3x378 ft., 2 story shops included. $55,000. W. O. Jones, city engr. CD 6/23—ENR 6/26.

Tex., Galveston—RECREATION CAMP, etc.—Recreation camp, appurtenances, utilities, $130,000; enlarging recreation area Stewart Beach, $100,000.

★**Tex., Houston**—AIRPORT—Municipal airport expansion. $800,000.

Tex., Houston—GOLF COURSE—Bond election soon, municipal 18 hole golf course. $250,000.

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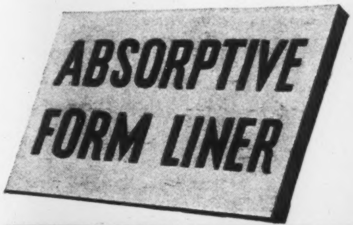

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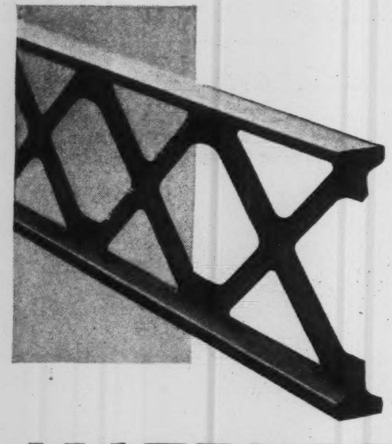

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UNCLASSIFIED (Proposed Work, Cont'd.)

★**Tex., Houston**—TRAFFIC SIGNAL SYSTEM, etc.—Traffic signal sys. and control devices, etc. $600,000.

Tex., Kemah—BOAT WORKS PLANT—C. B. Delhomme, 2101 Leeland St., Houston, bids soon boat works plant expansion, 2 runways, crane, machine shop, etc. $70,000.

Tex., Palacios—SWIMMING POOL, etc.—Recreational facilities, rein.-con. swimming pool, athletic courts, resort house playground facilities, grounds developments, etc. $250,000.

★**†Washington** — TRANSMISSION LINE — Bonneville Project, P. O. Box 3537, Portland, Ore. (third), 40 mi. 230,000 volt transmission line between North Bonneville and Vancouver. $1,225,190.

★**†Wash., Covington**—SUBSTATION—Bonneville Project, P. O. Box 3537, Portland, Ore., new substation. $2,211,950.

Wash., Ellensburg — AIRPORT — Plans airport, $321,000. CAA. F. L. Breckon, City Hall, engr.

★**†Wash., Everett**—AIR STATION—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., Naval Air Station Whidby Island, near here, $3,790,000.

†Wash., McChord Field — GAS STORAGE FACILITIES, etc.—U. S. Eng., Central Bldg., Seattle, additional gas storage facilities $18,-100, warehouse $19,400.

★**†Wash., Oak Harbor**—SEAPLANE BASE—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., Naval Seaplane Base. hangar and 4 seaplane ramps. $3,790,000.

★**†Wash., Port Townsend**—AMMUNITION DUMP—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., Naval Ammunition Dump addn. $1,100,000.

Wash., Pullman — AIRPORT IMPROVEMENTS—Grading, surfacing runways, airport. $50,000. WPA.

†Wash., St. John — SUBSTATION — Bonneville Power Administration, P. O. Box 3537, Portland, Ore., substation addns. $290,330.

★**†Wash., Seattle**—SHIPBUILDING PLANT—Todd Seattle Dry Docks, Inc., 1801 16 St. S.W., plans construction plant, for Navy Dpt., $900,000 for land and buildings, $100,000 for machinery and equipment. Total est. $1,000,000. Defense Plant Corp. will finance.

Wash., Spokane—AIRPORT—150x6,000 ft. runway with lights, drainage sys., taxi space, Felts Field, $150,000. CAA.

W. Va., Huntington—PIPELINE—West Virginia Gas Corp., Union Trust Bldg., Charleston, pipeline to connect Grapevine Creek and Lincoln County Gas fields. $200,000.

Wyoming — TRANSMISSION LINES — Big Horn Rural Electric Assn., M. M. Rough, supt., Basin, 130 mi. transmission lines. H. S. Nixon, Grain Exch. Bldg., Omaha, Neb., engr.

†Wyoming — TRANSMISSION LINE — Bureau Reclamation, Cody, 85 mi. transmission lines from Thermopolis to Cody to link Seminoe power plant with Shoshoni Dam. $300,000.

Wyoming—TRANSMISSION LINES—Riverton Valley Electric Assn., C. Van Dyke, supt., Riverton, rural transmission lines, $25,000. H. S. Nixon, Grain Exch. Bldg., Omaha, Neb., engr.

†Alaska, Sitka—PARKING AREA—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., seaplane parking area Naval Air Station. $60,000.

★**N. S., Sydney**—SHIPBUILDING PLANT—Secy. Dpt. Munitions & Supply, Ottawa, Ont., bids soon shipbuilding plant, Sydney Harbor, for Dpt. Munitions & Supply, Ottawa, Ont. $500,000-$700,000.

BIDS ASKED

Bids Asked after July 30

†Miss., Columbus—FLYING SCHOOL—U. S. Eng., Courthouse and Customhouse, Mobile, Ala., Advanced Twin Engine Flying School, near here. CD 7/8—ENR 7/10.

Bids Asked August 4

N. Y., New York—PARK LIGHTING—Comr. Parks at Office Dpt. Parks, Arsenal Bldg., Central Park, 5 Ave. and 64 St., park lighting in connection with repaving East Dr. in Central Park from E. 59 to E. 74 Sts., Contr. M-10-241.

N. S., Dartmouth—WHARF, etc.—Secy. Dpt. P. Wks., Ottawa, Ont., wharf imprvs., and dredging about $60,000. K. M. Cameron, c/o owner, engr.

Bids Asked August 5

N. Y., New York—DUMPING BOARD—At office President Manhattan Boro, Municipal Bldg., completion Contr. 9C, general construction, sanitation dumping board, E. 60 St., East River Dr. imprvt., E. 49 to E. 99 Sts. Bids 7/18 rejected. W. D. Binger, comr. Boro Works. CD 7/22—ENR 7/24, under LB.

N. S., Halifax—COALING PLANT—W. U. Appleton, c/o Canadian Natl. Ry., Moncton, N. B., F. O. Condon, ch. engr., Moncton, N. B., 250 ton rein.-con. coaling plant, Canadian Natl. Rys. Fairview Engine Terminal. About $45,000.

Bids Asked August 6

N. B., Saint John—PIER—Secy. Dpt. P. Wks., Ottawa, Ont., new East pier, Partridge Island, Saint John Harbor. $[illegible]. K. M. Cameron, c/o owner, engr.

Bids Asked August 7

N. J., Newark—AIR COMPRESSOR—Essex Co., Hall of Records Bldg., portable air compressor, for Hy. & Bridge Dpt. W. Stickel, Hall of Records Bldg., engr.

Bids Asked August 8

†Tex., Galveston — BOATHOUSE — U. S. Coast Guard Maintenance Officer, 327 Customhouse Bldg., New Orleans, La., boathouse superstructure with attached light tower, etc. $40,000.

Bids Asked August 9

★**†Miss., Columbus**—FLYING SCHOOL—U. S. Eng., Courthouse and Customhouse, Mobile, Ala., advanced twin engine flying school, grading, storm sewers, administration, housing, medical buildings, hangars, etc. $4,200,000. CD 7/25.

Bids Asked August 11

Ont., Raith—COALING DOCK—W. R. Devenish, genl. mgr. Canadian Natl. Rys., Winnipeg, Man., B. Wheelwright, ch. engr., Union Sta., Toronto, 100 ton coaling dock for Sioux Lookout line. Est. about $45,000.

Bids Asked August 15

†California—MIGRATORY FISH CONTROL—Bureau Reclamation, Customhouse, Denver, Colo., Balls Ferry fish rack and trap, migratory fish control, Kennett Div. Central Valley Project, about 18 mi. southeast of Redding. Spec. 1538-D.

Bids Asked August 20

Kan., Kansas City—PUMPING STATION—Bd. P. Utilities, structure for low pump. station. Over $100,000. Burns & McDonnell, 107 W. Linwood Blvd., Kansas City, Mo., engrs.

Bids Asked September [illegible]

N. Y., New York—TUNNELS—At office New York City Tunnel Auth., A. B. Jones, chn., 200 Madison Ave., Manhattan Tunnels, Brooklyn-Battery tunnel; adv. ENR 7/31.

Bids Asked

N. Y., Kanona and **Prattsburg**—TRACK REMOVAL—Kanona & Prattsburg R.R. Co., B. Merritt, genl. mgr., Prattsburg, removing tracks 12 mi. railway between Kanona and Prattsburg. Over $25,000. CD 7/11—ENR 7/17.

R. I., Pascoag—RACE TRACK—Burrillville Racing Asso., B. A. Dario, 531 Main St., Pawtucket, race track, grandstand, stables, steward's stand, clubhouse, landscaping. Over $150,000.

LOW BIDDERS

†Tex., Fort Bliss—FUELING SYSTEM—Con. Q.M., July 15, gasoline fueling sys. addn. Biggs Field, from Aqua Systems, Inc., 305 Grand Ave., New York, N. Y. **$82,314.** CD 7/11.

Tex., Fort Worth—HANGAR—S. H. Bothwell, city mgr., July 19, hangar imprvs. shop and office addn. to present hangar, 25x381 ft., from J. W. Padgett, 3616 Townsend Dr., **$41,333.** Est. $60,000. CD 7/10.

†Wash., Tacoma — SUBSTATION TRANSFORMERS—City, July 14, furnishing four 3333 kw. transformers for substation, from General Electric Co., 1 River Rd., Schenectady, N. Y. **$27,628.** CD 7/1.

★**†Alaska, Bethel**—AIRPORT — Civil Aeronautics Auth., Commerce Bldg., Wash., D. C., July 2, grading, paving and buildings for airport, from Morrison-Knudsen Co., 319 Bway., Boise, Idaho. **$1,566,358.** CD 6/25.

†Alaska, Iliamna — AIRPORT — Civil Aeronautics Auth., Wash., D. C., July 14, grading airport, and buildings, from R. H. Stock, Anchorage. **$369,300.** CD 7/8.

†Alaska, Tanacross—AIRPORT—Civil Aeronautics Auth., Commerce Bldg., Wash., D. C., July 14, grading and buildings for airport, from Lytle & Green, Sioux City, S. D. **$189,-420.** CD 7/8.

†Alaska, Tanana — AIRPORT — Civil Aeronautics Auth., Commerce Bldg., Wash., D. C., July 14, grading and buildings for airport, from R. H. Stock, Anchorage. **$487,700.** CD 7/8.

CONTRACTS AWARDED

†Ark., Little Rock—SPORTS ARENA, etc.—Con. Q.M., Camp Joseph T. Robinson, sports arena, vehicle sheds, 3 hospital wards, to William Peterson, Inc., Commercial Natl. Bank Bldg., **$119,900.** Bids 6/30.

★**†Ariz., Mesa**—RUNWAYS, etc.—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., runways, aprons, taxiways, Mesa Military Airport, to Pearson & Dickerson Contractors, Inc., Prescott, J. A. Casson, Hayward, Calif., Oswald Bros., 366 E. 58 St., Los Angeles, Calif., Lee Moor Contg. Co., Bassett Tower, El Paso, Tex., Tanner Constr. Co., 731 N. 19 Ave., Phoenix, and Phoenix-Tempe Stone Co., Box 1832, Phoenix, Ariz., **$1,878,061.** Bids 6/30—awarded 7/23. CD 7/14—ENR 7/17.

★**California** — POLE LINE, etc. — Southern California Telephone Co., 740 S. Olive St., **Los Angeles,** 88 mi. pole line between Yermo

UNCLASSIFIED (Contracts Awarded, Cont'd.)

and Cadiz, **$200,000;** underground cable between Los Angeles and Newhall, **$326,000;** pole line and facilities between Newhall and Yermo, **$716,000,** own forces. Grand total $1,-242,000.

Calif., Los Angeles—GAS HOLDER—Southern California Gas Co., 810 S. Flower St., design and construction gas holder, to Bartlett Hayward Div. Koppers Co., 2000 Koppers Bldg., Pittsburgh, Pa. Est. over **$40,000.** CD 5/1—ENR 5/8.

Calif., Los Angeles—LOADING DOCK—Southern California Freight Lines, 1121 S. Mateo St., 60x98 ft. rein.-con. columns, steel trusses loading dock addn. concrete bsmnt., 1121 S. Mateo St., to Harman & Co., 4540 Cutter St., approx. **$25,000.** Walker & Eisen, 1110 Wright & Callander Bldg., 405 S. Hill St., archts.

†**Calif., Paso Robles**—FUELING SYSTEM—Con. Q.M., Camp San Luis Obispo, A. C. gasoline fueling sys., to Aqua Systems, Inc., 385 Gerard St., New York, N. Y. **$29,578.** CD 6/19.

Calif., South San Francisco—SHIPYARD—Western Pipe & Steel Co. of Calif., 225 Bush St., San Francisco, three 2 story and two 1 story frame buildings, with corrugated iron covering, in connection with shipyard plant, to Carrico & Gautier, 365 Ocean Ave., San Francisco. Approx. **$60,000.** CD 7/21.

Calif., Stockton—ICE SKATING RINK—M. J. Rowell and S. S. Parsons, c/o contractor, reconstructing present building for ice skating rink and constructing parking areas, to O. H. Chain, 41 S. Sutter St. **$150,000** (guaranteed fixed cost).

★†**Calif., Victorville**—APRONS, etc.—U. S. Eng., 751 S. Figueroa St., Los Angeles, aprons, runways, taxiways, Military Airport, to Bressi-Bevanda Constructors, Inc., 208 W. 8 St., Los Angeles, **$1,317,245.** Awarded 7/23.

Calif., Visalia—HANGARS—Visalia-Dinuba School Aeronautics, Visalia, two 100x200 ft. steel frame hangars, and 30x200 ft. shop units, etc., North Visalia, to C. I. and W. P. Stoner, 116 Alexander Ave., Claremont. Est. over **$40,000.**

Conn., Middletown—UNDERGROUND PIPING—P. Wks. Dpt., State Office Bldg., Hartford, steam and hot water underground piping sys., replacements and repairs, Middletown State Hospital, to William H. Box Co., 271 Sheldon St., Hartford, **$199,386.**

★†**Ga., Albany**—FLYING SCHOOL—U. S. Eng., 1 and Douglas Sts. N. W., Wash., D. C., landing field, 50 additional buildings, utilities, to Hardaway Contg. Co., 15—11 St. Columbus, **$1,194,820.**

Ga., Augusta—APRONS—Paving 2 aprons, draining sys., electric service pits, municipal airport, to Norman R. and E. H. Latham, Jr., West Palm Beach, Fla., **$105,034.** Est. $125,034. Awarded 7/20.

Mass., Worcester—OIL TERMINAL—Sun Oil Co., 711 Statler Bldg., Boston, bulk oil terminal, warehouse, garage, office bldg., oil tanks, West Boylston St., to Mauro Constr. Co., Inc., 601 Turks Head Bldg., Providence, R. I. Est. **$45,000.** Bids 7/3.

†**N. J., Clark**—GAS LINES, etc.—Federal Works Agency, Wash., D. C., gas lines, telephone sys., electrical sys., preparing site for housing, **WPA. $57,033.** CD 7/11—ENR 7/17.

†**N. J., Fort Dix**—APRON SURFACING, etc.—Con. Q.M., surfacing taxiways and aprons, to Foundations, Inc., 61 E. Main St., Moorestown, **$161,051.** CD 6/17—ENR 6/19.

†**N. J., Fort Dix**—GASOLINE STORAGE—Con. Q.M., gasoline storage facilities for Air Field, to Aqua Systems, Inc., 385 Gerard Ave., New York, N. Y., **$42,522.**

N. J., Morristown—AIRPORT IMPROVEMENTS—U. S. Eng., 17 Battery Pl., New York, drainage, excavating, grading, paving runways, lighting and landscaping airport, to J. P. Burns, Knickerbocker Rd., Dumont, **$252,977.**

†**N. J., Pedricktown**—LANDSCAPING, etc.—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., landscaping, grading, excavating, paths, walls, etc, Delaware Ordnance Depot. **WPA. $62,500.** CD 6/19—ENR 7/3.

N. Y., Brooklyn—CONDUIT, etc.—Police Dpt., 240 Center St., New York, installing conduit, post found., conductor cable, posts, lanterns and control apparatus for police traffic signals, **WPA. $67,843.** W. W. Johnston, 70 Columbus Ave., New York, dir. Div. Operations.

N. Y., Brooklyn—PLAYGROUND, etc.—Dpt. Parks, Arsenal Bldg., Central Park, 64 St. and 5 Ave., New York, playground and comfort station E. 12 St. to Homestead Ave. and William Court to Belt Parkway, **WPA. $141,-817.** W. W. Johnston, 70 Columbus Ave., dir. Div. Operations.

N. Y., New York—PARK IMPROVEMENTS—Dpt. Parks, Arsenal Bldg., Central Park, 5 Ave. and 64 St., imprvs. St. Nicholas Park, Riverside Park exten., **WPA. $124,429.** W. W. Johnston, 70 Columbus Ave., dir. Div. Operations.

★†**N. Y., Rome**—AIR DEPOT—U. S. Eng., Security Bldg., Binghamton, air depot, to Turner Constr. Co., 420 Lexington Ave., New York, and Louis Mayersohn, 75 State St., Albany, **$10,000,000.** Air Depot Engineers, consisting of Alfred Easton Poor, Gibbs & Hill,

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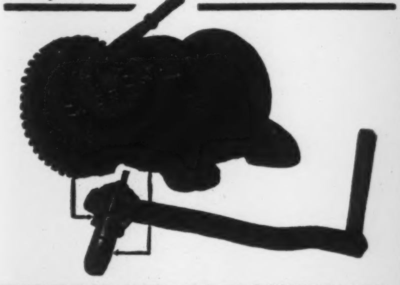

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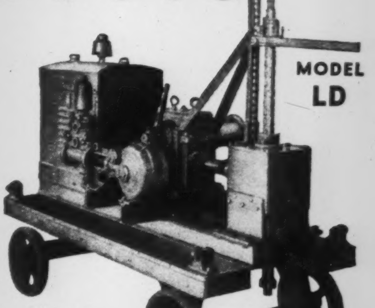

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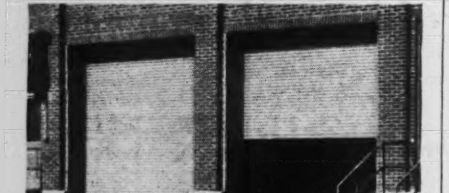

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and Fred N. Severud, 25 West 45 St., New York, archts. and engrs. (**Correction** Contractor.) CD 7/18—ENR 7/24, under CA.

N. C., Chapel Hill—AIRPORT—University of North Carolina, F. P. Graham, pres., airport imprvs., **WPA. $130,439.**

O., Dayton—HANGAR—See Proposed Work.

★**†Ore., Astoria** — NAVAL AIR STATION — Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., additional buildings, facilities, Tongue Point Naval Air Station, to Austin Co., 16112 Euclid Ave., Cleveland, O. **$2,000,000.**.

Pa., Kane—PARK—J. M. Paisley, boro secy., developing Glenwood Park, incl. walks, roadways, swimming pool, tennis courts, etc., own forces. **$25,000.** CD 7/11—ENR 7/17.

†Pa., Middletown—AIRPORT—U. S. Eng., 332 Post Office Bldg., Baltimore, Md., runways, aprons, parking areas, drainage, Middletown Air Depot, to George & Lynch, Newport Gap Park, Wilmington, Del., **$482,482.** Bids 6/23. CD 6/17—ENR 6/19.

†Pa., Middletown—DOCK—U. S. Eng., 332 Post Office Bldg., Baltimore, Md., 200x260 ft. airplane repair dock and utilities, Army Air Depot, to Ritter Bros., 1511 N. Cameron St., Harrisburg, **$367,175.** Bids 6/23. CD 6/10—ENR 6/12.

Tex., Coleman—AIR TRAINING SCHOOL—Facilities for Air Training School, to J. M. Odem Constr. Co., 301 Fannin St., Austin. Approx. **$105,000.**

Utah, Salt Lake City—TRACK REMOVAL—Utah Light & Traction Co., Kearns Bldg., removing street car tracks and repairing pavement 27 blocks city streets, to Gibbons & Reed, 165 E. 4 S. St., **$61,500.** J. Woolley, Kearns Bldg., ch. engr.

†Va., Langley Field—TANK—U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., N.A.C.A. Tank 2, to Midland Constructors, Inc., Chicago, Ill., **$295,000.**

★**†Alaska**—NAVAL AIR STATION—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., warehouses, recreation facilities, hangars, aprons, living quarters, additional facilities, Sitka, Kodiak and Unalaska Naval Air Stations, to Siems-Drake-Puget Sound Co., 2929 16 Ave. S.W., Seattle. Wash. **$26,029,722.**

B. C., Fort St. John—FIELD DEVELOPMENT—Dpt. Transport, Ottawa, Ont., field development work, airport to Tomlinson Constr. Co., Ltd., 1 Somerset Bldg., Winnipeg, Man., about **$250,000.**

Ont., Brampton—GREENHOUSES—W. E. Calvert, 485 Main St. N., greenhouses, to Lord & Burnham Co., Ltd., Harbour Comn. Bldg., Toronto, about **$75,000.** CD 3/13—ENR 3/20.

Ont., Dunnville—AERODROME—Dpt. Transport, Ottawa, developing aerodrome, clearing, grubbing, grading, fencing, hard-surfaced runways, etc., to Scott-Jackson Constr. Co., Ltd., 57 Bloor St. W., Toronto, about **$140,000.**

Ont., Petawawa—RIFLE RANGE—Dpt. National Defense, Ottawa, rifle range, Military Camp, to McLaughlin Brothers, 120 Scott St., Ottawa, **$40,000.**

Ont., Toronto—HANGAR BUILDING—DeHavilland Aircraft of Canada, Ltd., Postal Sta. L, flight test hangar building, to A. W. Robertson, Ltd., 57 Bloor St. W. Est. about **$75,000.** D. Shepherd, 57 Bloor St. W., engr.

Sask., Saskatoon—TAXI STRIPS, etc.—Dpt. National Defense for Air, Ottawa, Ont., taxi strips, grade work, excav., drainage, S.F.T. School 4, to Evans Gravel Surfacing Co., Ltd., 23 St. and Avenue E, **$85,000.**

Yukon Territory, Whitehorse — AERODROME—Dpt. Transport, Ottawa, Ont., developing aerodrome, to British Yukon Navigation Co., Ltd., Vancouver, B. C., **$319,000.**

LATIN AMERICA

South America, Brazil—Plans airplane factory, at **Lagao Santa,** Minas Geraes***plant for production anhydrous alcohol, **Ponta Nova, Minas** Geraes***window glass factory, **Rio de Janeiro*****85,000 hp. electric power plant, **Sao Leopoldo,** State Rio de Grande do Sul***steel plant, **Velta Redonda,** State Rio de Janeiro.

PUBLIC BUILDINGS

PROPOSED WORK

Ala., Anniston—Anniston Housing Auth., 92 unit housing, Project ALA-4-2. $311,400. USHA allot. CD 2/10—ENR 2/13.

Ala., Fort Payne—Fort Payne Housing Auth., 48 unit housing, Project Ala 11-1. $156,600 USHA allot. CD 2/14—ENR 2/20.

Ala., Gadsden—Bd. Educ., c/o C. A. Donahoo, supt., plans by P. W. Hofferbert, 220 W. 8 St., Junior High School. $160,000.

†Ala., Ozark-Enterprise—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., camp. J. E. Sirrine & Co., Greenville, S. C., archt. and engr. CD 7/22—ENR 7/24.

†Ariz., Fort Huachuca—War Dpt., 20 St. and Constitution Ave, N.W., Wash., D. C., camp. Headman, Ferguson & Carollo, Phoenix, archts. and engrs. CD 7/22—ENR 7/24.

Ark., El Dorado—W. L. Goodwin, mayor, municipal auditorium. $150,000.

★**Ark., Fort Smith**—Fort Smith Housing Auth., 150 unit housing, Project Ark 3-2. $540,000 USHA allot. CD 6/3.

Ark., North Little Rock—North Little Rock Housing Auth., 92 unit housing, Project Ark 2-2. $315,000 USHA allot. CD 2/7—ENR 2/13.

★**†Calif., Burbank**—Menasco Mfg. Co., Burbank, plans construction, equipping plant for manufacture aircraft equip. for War Dpt. $291,870 for land and buildings, $1,347,188 for machinery and equip. Total est. $1,639,058. Defense Plant Corp. will finance.

★**Calif., Burbank**—Burbank Unified School Dist., plans by J. C. Austin, 608 Chamber of Commerce Bldg., Los Angeles, school buildings and expansion program, various locations. $2,582,000.

Calif., Fresno—City of Fresno School Dist., instructs L. L. Smith, bus. mgr., to apply for Federal gr. to construct school. $325,000.

★**Calif., Martinez**—Contra Costa Co. Housing Auth., G. Gill, chn., c/o County Clerk, Martinez, 56 unit housing, Project CAL 11-1, Martinez, 94 unit, Project CAL-11-2, Pittsburg, 36 unit, Project CAL-11-3, Antioch, 44 unit, Project CAL-11-4, Brentwood. $838,800 USHA allot. CD 2/13—ENR 2/20.

Calif., Napa—Napa Union High School Dist., plans by W. G. Corlett, Bank of America Bldg., Oakland, rein.-con., steel shop buildings, gymnasium for high school. Over $150,000. CD 6/19—ENR 6/26.

★**†Calif., Richmond** — Richmond Housing Auth., W. Richards, Jr., chn., 271-10 St., 450 defense housing units, for USHA. $1,500,000. C. I. Warnecke, Financial Center Bldg., Oakland, archt. CD 7/10—ENR 7/17.

★**†Conn., Bridgeport**—Bridgeport Brass Co., Housatonic Ave. and Grand St., brick, steel plant for manufacture cartridge cases. $4,275,000. Stone & Webster Eng. Co., 90 Broad St., New York, N. Y., engrs. Defense Plant Corp. will finance. CD 7/23.

†Conn., Groton—Federal Works Agency, Wash., D. C., 100 homes for enlisted personnel Naval Submarine Base. $350,000.

Conn., Hartford—Isolation Hospital, revised plans 3 story, brick, steel isolation unit, Holcomb St. $475,000. Thomas F. Foley, 550 Main St., federal agt.

★**†Conn., New Haven**—Federal Works Agency, Wash., D. C., 500 defense housing units. $1,750,000.

†Conn., New Haven—M.B. Mfg. Co., Inc., 1060 State St., additional building and machinery for Navy Dpt. $190,000. Defense Plant Corp. will finance.

Conn., New London — Chapman Technical High School, W. T. Hopson, pres. Bd. Trustees, brick, steel high school addn., Waller St. $150,000.

★**†D. C., Wash.**—Public Bldgs. Administration, Wash., D. C., 3 story, bsmnt., subbsmnt., 50x300 ft., materials testing laboratory of National Bureau Standards for Dpt. Commerce. $600,000.

Fla., Daytona Beach—Daytona Beach Housing Auth., 66 unit housing, Project FLA-7-2. $221,400 USHA allot. CD 2/7—ENR 2/13.

Fla., Jacksonville — Expanding municipal electric power plant. $2,000,000.

Fla., Lakeland—Lakeland Housing Auth., J. R. Wright, chn., 60 unit housing, Project FLA-11-2. $189,000 USHA allot. CD 2/5—ENR 2/13.

†Fla., Pensacola—Pensacola Housing Auth., 100 unit housing, for Naval Air Station and 100 unit for Ellyson Field, for USHA. Younge & Hart, Thiesen Bldg., archts.

Ga., Albany—Albany Housing Auth., 48 unit housing, Project GA 23-1 and 56 unit, Project GA 23-2. $353,700 USHA allot. CD 2/7—ENR 2/13.

Idaho, Nampa—Nampa Housing Auth., 75 unit housing, Project Ida-2-1. $270,000 USHA allot. CD 3/24—ENR 3/27.

†Ill., Chanute Field (Rantoul)—Con. Q.M., field house for sports. $77,000.

★**†Ill., Marion**—Veterans Administration, Arlington Bldg., Wash., D. C., hospital buildings. Over $500,000.

†Ill., Scott Field (Belleville)—U. S. Eng., 816 U. S. Courthouse and Customhouse, St. Louis, Mo., 1,000 man reception center, Military Post.

Ky., Corbin—Corbin Co. Housing Auth., 50 unit housing, Project Ky 10-1. USHA $180,000 allot. CD 2/7—ENR 2/13.

†Ky., Lexington—Con. Q.M., cancelled bids to have been opened August 5, Warehouses 3 and 5 and 4 and 6, administration building, heating plant, etc.; adv. ENR 7/31. CD 7/22—ENR 7/24.

★**Ky., Owensboro**—Owensboro Housing Auth., 124 unit housing, Project Ky 9-1 and 50 unit, Project Ky 9-2. $627,300 USHA allot. CD 2/10—ENR 2/13.

Louisiana—Housing Auth. of Ascension (Donaldsonville), Assumption (Napoleonville), Iberville (Plaquemine), Point Coupee (New Roads), St. James (Convent), and West Baton Rogue (Port Allen) Parishes, 280 unit housing, Project LA-9-1. $495,000 USHA allot.

Louisiana—Housing Auth. of St. Tammany (Covington), Tangipahoa (Amite), and Washington (Franklinton) Parishes, 200 unit housing, Project LA-8-1. $360,000 USHA allot.

PUBLIC BLDGS. (Proposed Work, Cont'd.)

★**Louisiana**—Housing Auth. of Iberia (New Iberia), Lafayette (Lafayette), St. Martin (Saint Martinville), St. Mary (Franklin) and Vermilion (Abbeville) Parishes, 490 unit housing, Project LA-7-1. $855,000 USHA allot.

La., Monroe—Monroe Housing Auth., 50 unit housing, Project LA-6-1, and 76 unit, Project LA-6-2. $450,000 USHA allot. CD 2/7—ENR 2/13.

★**La., New Orleans**—New Orleans Housing Auth., 540 unit housing, Project LA-1-4. $2,187,000 USHA allot.

La., Shreveport—Caddo Parish Housing Auth., Shreveport, 100 unit housing, Project LA-22-1. $180,000 USHA allot.

★**La., Shreveport** — Shreveport Housing Auth., bids soon 270 unit low rent housing, Proj. La. 2-1, $1,129,000. CD 10/11—ENR 10/17.

Me., Kittery—Supt. Schools, Town Hall, sketches by Wells, Hudson & Granger, Main St., Hanover, N. H., Wentworth Dennett School addn.; 16 room addn. Treit Academy; New Mitchell Elementary School, all brick, stone, concrete fdns. Over $300,000.

Mass., Chicopee—School Com., 135 Grape St., bids in August, 1 and 2 story, bsmnt. 62x186 ft., brick, limestone trade school, concrete fdn., 1 story, bsmnt., ells, 80x200 ft. and 50x150 ft. $180,000. H. J. Tessier, 220 Duright St., Springfield, archt.

Mass., Lynn—Lynn Hospital, D. Traver, supt., 212 Boston St., plans by Stevens, Curtin, Mason & Riley, 45 Newbury St., Boston, story, bsmnt., brick, steel, stone hospital, concrete fdn. $350,000.

★**Mich., Detroit**—Bd. Educ., 1354 Bway., student center building for Wayne University. $700,000.

★**Mich., Detroit**—Detroit Housing Auth., 735 Randolph St., plans by Smith, Hinchman & Grylls, 800 Marquette Bldg., and C. Howard Crane & Assoc., 112 Madison Ave., Jeffries Homes housing, $10,000,000; plans by Harley & Ellington, 1507 Stroh Bldg., and Clarence E. Day, Inc., Donovan Bldg., 2 story, bsmnt. Douglas Apartments, $4,000,000.

Mich., Hamtramck (br. Detroit) — Hamtramck Housing Comn., 8581 Jos Campau Ave., J. Wojcik, secy.-dir., 36 unit housing, Project MICH-4-2. $173,700 USHA allot. CD 2/4—ENR 2/6.

Minn., Mankato—Bd. Educ., rebuilding high school destroyed by fire. Over $250,000.

Miss., Tupelo—Tupelo Housing Auth., 60 unit housing, Project MISS 8-1. $234,900 USHA allot. CD 2/7—ENR 2/13.

†**Mo., Jefferson Barracks (St. Louis P. O.)**—U. S. Eng., 816 U. S. Courthouse and Customhouse, St. Louis, rejected bids May 16, 6,000-man mess, 156x325 ft., and 38x47 ft. boilerhouse. CD 5/6—ENR 5/8, under LB.

Mo., Poplar Bluff—Poplar Bluff Housing Auth., plans by J. Carl Hourdan, Poplar Bluff, low-cost housing.

★**Mo., St. Louis**—St. Louis Housing Auth., B. B. Craven, exec. dir., Civil Courts Bldg., 42 unit housing, Project MO-1-3. $3,128,400 USHA allot. CD 5/16—ENR 5/22.

†**Mo., Weldon Springs**—Farm Security Administration, Wash., D. C., 200 dormitory units for single men, Weldon Springs Ordnance Plant.

★**N. H., Portsmouth**—Supt. Schools, 126 Daniels St., sketches by Wells, Hudson & Granger, Main St., Hanover, 50 room brick, steel Senior High School, $500,000; 10 room addn., auditorium, Atlantic Heights School, $150,000; 7 room school at The Plains.

N. Y., Jamestown—Housing Auth. (to be formed), c/o L. F. Roberts, mayor, City Hall, housing p. Over $200,000.

N. C., Graham—Bd. Comrs. Alamance Co., Graham, $200,000 bond election Sept. 2 general county hospital.

★**N. C., Wilmington**—Bd. Comrs. New Hanover Co., A. Hewlett, Sr., chn. Bd., Wilmington, voted bonds school buildings. $500,000. CD 5/2—ENR 5/8.

★**N. C., Winston Salem**—Housing Auth., J. C. Whitaker, chn., slum clearance and low cost housing for white and negro tenants. $1,400,000. USHA loan approved.

N. Y., Buffalo—Buffalo Housing Auth., 200 unit housing, for negro industrial workers.

★**N. Y., New York**—New York City Housing Auth., 122 E. 42 St., Jacob Riis Houses, for 1,354 families. $6,000,000. Land being acquired.

★**N. Y., St. George**—New York City Housing Auth., 122 E. 42 St., New York, G. Swope, chn., Edwin Markham Houses, for 400 families. $2,000,000. Land being acquired.

★†**N. Y., Tonawanda**—General Motors Corp., General Motors Bldg., Detroit, Mich., Chevrolet plant addn. $33,200,000. Defense Plant Corp. will finance.

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PUBLIC BLDGS. (Proposed Work, Cont'd.)

★ †**O., Akron**—Firestone Tire & Rubber Co., 1278 S. Main St., Akron, 1 story, brick, steel synthetic rubber plant. $1,250,000 incl. equip. Defense Plant Corp. will finance. Wilbur Watson & Assoc., 4614 Prospect Ave., Cleveland, engrs. CD 7/2—ENR 7/10.

★ **O., Cincinnati**—Bd. Comrs. Hamilton Co., bond election in November, court house addn. $750,000. H. Coates, co. engr.

★ †**O., Cleveland**—Cleveland Housing Auth., Cleveland, plans by R. Dickerson, 3030 Euclid Ave., 500 units 1, 2 and 4 family apartments, for USHA. $2,000,000. CD 7/10—ENR 7/17.

★ **O., Dayton**—Bd. Educ., Van Buren Twp., school, Shroyer Rd., near here. $500,000. Site purchased.

O., Massillon—2 story, brick, steel, concrete school and 8 room addn. Jones High School. $400,000. PWA assistance sought.

†**O., Ravenna-Warren**—Farm Security Administration, Wash., D. C., 500 dormitory units for civilian employees, Ravenna Ordnance Works.

O., Vandalia — Bd. Educ., Butler Twp., school. $400,000. PWA funds requested.

Pa., Allentown—Allentown Housing Auth., 110 unit housing, Project PA-4-2. $459,000 USHA allot. CD 3/25—ENR 3/27.

★ **Pa., McKeesport** — McKeesport Housing Auth., W. D. Mansfield, chn., 50 unit housing, Project PA-5-2 and 150 unit, Project PA-5-3. $914,400 USHA allot. CD 7/17/40—ENR 7/25/40.

Pa., Meadville—Commonwealth of Penna., Dpt. Hys., A. J. Warlow, ch. engr., Harrisburg, bids soon brick, steel, truss highway garage. $165,000.

★ **Pa., Phila.**—General State Auth., 2 and Locust Sts., Harrisburg, plans by G. W. Pepper, Jr., Lewis Tower Bldg., Phila., imprv. program, new working patient building, 2 buildings for senile patients, laboratory and chronic building, altering existing sub-standard building, increasing laundry and warehouse capacity, additional power and utilities service, Phila. State (Byberry) Hospital. Total est. $6,000,000. Day & Zimmerman, Packard Bldg., engrs. CD 2/4—ENR 2/6.

★ †**Pa., Shamokin**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., general army storage depot. $1,000,000.

★ **Pa., Uniontown** — Fayette Co. Housing Auth., C. M. Chisholm, exec. dir., Court House, plans by J. B. Harmon, 129 Evans St., E. R. Johnson, 24 Robinson St., H. W. Altman, 306 Fayette Title & Trust Bldg., and J. E. Burke, c/o owner, all in Uniontown, 150 family unit housing development, Connellsville, 100 family unit, Brownsville, and 100 family unit, Masontown. $1,069,200. CD 5/7—ENR 5/15.

R. I., North Kingston—L. M. Wager, supt. Schools, brick, steel school, Quonset Dist. $150,000.

Tenn., Nashville—Bd. Educ., W. A. Bass, secy., school, Waverly-Belmont Sect. $285,000.

Tex., Arlington—North Texas Agricultural College, Arlington, plans by A. C. Finn, Bankers Mortgage Bldg., Houston, classroom building. $175,000.

Tex., Bay City—Bay City Ind. School Dist., plans by Hedrick & Lindslay, c/o Union Natl. Bldg., Houston, Junior High School. $190,000.

Tex., Beaumont—Plans by W. B. Livesay, c/o San Jacinto Life Bldg., hospital. $165,000.

Tex., Brownwood — Brownwood Housing Auth., 90 unit housing, Project TEX-2-1. $315,000 USHA allot. CD 2/17—ENR 2/20.

Tex., Dallas—Dallas Housing Auth., c/o J. L. Stephenson, exec. dir., 2525 Lucas Dr., revised plans by J. N. McCammon, M. Lemmon and R. Bryan, assoc. archts., 213 Tower Petroleum Bldg., 250 unit negro housing, F. Chappel, Burt Bldg., structural engr., Zumwalt & Vinther, Thomas Bldg., mechanical engr., revised plans by A. Thomas, W. Sharp, & E. Welch, Construction Bldg., 220 unit Cedar Springs Pl. housing R. O. Jameson, S. W. Life Bldg., structural engr. Kribs & Landauer, Dallas Gas Bldg., mechanical engrs. Bids June 10 rejected. Will readvertise. CD 6/12—ENR 6/19 under LB.

Tex., Fort Worth—Fort Worth Housing Auth., 500 W. Belknap St., plans by C. O. Chromaster, 401 Century Bldg., and soon takes bids 64 additional housing units. $325,000. No bids opened May 22. CD 5/16—ENR 1/23.

Tex., Fort Worth—Plans by P. M. Geren, 806½ Burnet St., 1 story, 200x371 ft. warehouse, 1 story, 50x235 ft. street department sheds, 1 story, 50x150 ft. sewer and signal department sheds, 50x120 ft. and 30x352 ft. garbage sheds, 25x50 ft. garbage assembly rooms. $165,000.

★ **Tex., Houston**—Bond election soon, central fire station and fire alarm sys. $1,250,000.

★ **Tex., Houston**—Maternity and children's hospital plant. $2,000,000.

★ **Tex., Orange**—High school. $5[illegible] PWA.

†**Tex., Paris**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., camp. Rawlins & Forrest, Praetorian Bldg., Dallas, archts. and engrs. CD 7/22—ENR 7/24.

†**Tex., San Antonio**—U. S. Eng., Federal Bldg., Galveston, 30 buildings for Cadet Replacement Center. $300,000.

★ **Tex., Stephenville**—Jno. Tarlton Agricultural College, Stephenville, plans by A. C. Finn, Bankers Mortgage Bldg., Houston, Project 1, 2 story dormitory, $[illegible],000; Project 2, dormitory, $200,000; 2 story agricultural building, $200,000. Funds authorized by Legislature.

★ **Tex., Terrell**—Terrell State Hospital, Terrell, 3 ward and hospital buildings, $39[illegible]000; main hopital building, $400,000.

Tex., Wichita Falls—Wichita Falls State Hospital, ward and hospital buildings. $260,000.

Tex., Winters—Voted $175,000 bonds; light plant. $200,000.

★ **Wash., Seattle**—Public safety bldg. $1,000,000. Federal funds sought.

Wash., Seattle—King Co., County-City Bldg., fire station, Harbor Island. $150,000.

Wash., Tacoma—School Bd., vocational school. $225,000.

Wis., Green Bay—State Dpt. P. Welfare, Madison, 1 story, 30 x 200 ft., granite, brick machine warehouse, Wisconsin State Reformatory Farm, day labor.

Wis., Madison—A. W. Bareis, city clk., Madison General Hospital addn. $350,000.

Wis., Manitowoc—Bd. Educ. plans by P. Brandt, Dempsey Bldg., 1 story, 80x190 ft. brick, steel shop wing addn. Lincoln High School, concrete fdn. $140,000.

†**Alaska**—Office Indian Affairs, Dpt. Interior, Wash., D. C., tuberculosis hospital for Alaskan Indians. $250,000.

Alaska, Ketchikan—School. $190,000.

†**Alaska, Kodiak**—Navy Dpt., 18 St. and Constitution Ave. N.E., Wash., D. C., consolidated shop building for submarine base. $150,000.

†**Alaska, Kodiak**—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., storehouse, accessories for submarine base. $400,000.

BIDS ASKED

Bids Asked August 5

★ †**Ky., Avon**—Con. Q.M., McClelland Bldg., Lexington, revised bids Warehouse 3 and 5, Warehouse 4 and 6, administration building, substation, railroads and roads, walks, grading, etc. $3,000,000. Allied Engineers & Architects, c/o J. F. Wilson, J. S. Watkins, G. S. Bell, J. K. Latham, McClelland Bldg., Lexington, archts. CD 7/18—ENR 7/24, under LB.

Bids Asked August 8

†**N. C., Charlotte**—Charlotte Housing Auth., 831 Siegel Ave., defense housing, Project NC31041-X. M. R. Marsh, Builders Bldg., Charlotte, archt.

Bids Asked August 12

Ky., Louisville—Louisville Municipal Housing Comn., 1013 Realty Bldg., housing project Ky. 1—4.

Bids Asked August 18

Ia., Spencer—M. M. Moulton, city clk., steam heat plant alterations and distr. $60,000. CD 5/21—ENR 5/29.

Mo., Columbia—75,000 lb. per hr. cap. steam generating unit in connection power plant imprvs. $100,000. Burns & McDonnell, 107 W. Linwood Blvd., Kansas City, Mo., engrs.

Bids Asked August 26

★ **Calif., San Francisco**—Housing Auth. Directors of City and County of San Francisco, 525 Market St., De Haro Plaza low-rent housing Proj. Cal. 1-9, comprising sixteen 2½ story and one 2 story buildings and one 2½ story administration building. $600,000. D. D. Stone, 381 Bush St., and C. E. J. Rogers, Phelan Bldg., archts. CD 6/24—ENR 6/26.

Ia., Waverly—R. O. Clark, city clk., imprv. municipal electric light and power plant, new Diesel generating unit and all auxiliary equip. $87,000. Stanley Eng. Co., Muscatine, engrs. CD 7/21—ENR 7/24.

†**Me., Togue**—Veterans Administration, 764 Arlington Bldg., Wash., D. C., 1 story, bsmnt., 45x60 ft. Library 220, $50,000.

Bids Asked

†**Ill., Scott Field (Belleville)**—U. S. Eng., 816 U. S. Courthouse and Customhouse, St. Louis, Mo., bids soon 32 mobilization type buildings, 1,000-man reception center, barracks, officers' quarters, administration building, processing building, etc. CD 7/23—ENR 7/31.

Nev., Winnemucca — Trustees Humboldt County School Dist., high school. $170,000 bonds voted. F. A. Brinkman, Kalispell, Mont., archt. CD 4/1—ENR 4/3.

★ †**Va., Arlington**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., office building. $35,000,000. G. E. Bergstrom, 3757 Wilshire Blvd, Los Angeles, Calif. archt.

PUBLIC BLDGS. (Continued)

LOW BIDDERS

Calif., Berkeley—Regents of University of California, Berkeley, July 22, women's dormitory, from K. E. Parker, 135 South Park, San Francisco, **$244,625.** CD 6/24—ENR 6/26.

★**Calif., Los Angeles** — Bureau Power & Light, 207 S. Bway., July 23, 1 steam generating unit, from Westinghouse Electric & Mfg. Co., 420 S. San Pedro St., **$1,027,357.** CD 6/18.

★**Calif., Los Angeles** — Bureau Power & Light, 207 S. Bway., July 23, furnishing steam generating unit, 570,000 lb. steam per hr. capacity for Harbor Steam Plant, Spec. 3815, from Riley Stoker Corp., 408 S. Spring St. **$697,465.** CD 6/18.

★**†Conn., Fairfield**—Federal Works Agency, Wash., D. C., 200 dwelling units, defense housing, Conn. 2072 X, Fairfield Woods, Melville and Burroughs Rds., from M. Shapiro & Son Constr. Co., 755-7 Ave., New York, N. Y. **$896,000.** CD 7/18—ENR 7/24.

†Conn., Windsor Locks — Federal Works Agency, Wash., D. C., July 25, defense housing, 85 units, Conn. 6081 X, from R. Jackson, 214 High St., Boston, Mass. **$367,105.** CD 7/15—ENR 7/17.

Ga., Albany—Albany Housing Auth., E. Wethbee, Jr. chn., July 17, housing, Project GA. 9071-X, from R. J. Edgerly, Albany. **$297,442.** CD 7/15.

N. J., Teaneck—Bd. Educ., City Hall, July 17, 2 story, bsmnt., 150x200 ft., brick school, Teaneck Rd., from Reliable Constr. Co., 604 Anderson Ave., Grantwood, **$196,500.** CD 7/8—ENR 7/10.

★**N. Y., Brooklyn**—Dpt. P. Wks., Municipal Bldg., New York, July 22, Brooklyn Terminal Market, from Federal Constr. Corp., 101 Park Ave., New York, **$1,067,700.** base bid. CD 7/18—ENR 7/10.

N. Y., Utica—Bd. Educ., City Hall, gymnasium, from Charles and Frank Alt, 1571 Steuben St. Est. **$300,000.** Kinne & Frank, Hopper St., archts.

★**†Pa., Phila.**—Philedelphia Housing Auth., 21 St. and Parkway, defense projects, for USHA, from H. R. H. Constr. Co., 9 E. 40 St., New York, N. Y., 700 units 36014X **$2,997,000;** 500 units 36015X **$1,942,000;** 200 units 36016-X **$793,000.** CD 7/17.

★**Pa., Phila.**—Phila. Housing Auth., 21 St. and Parkway, July 9, 64 unit James Weldon Johnson and 77 unit Tasker housing, from Gaw Constr. Co., 2322 Grays Ferry Rd. **$660,000.**

Pa., Royersford—Montgomery County Institute Dist., Norristown, July 16, hospital, from Hood & Gross, Perry Bldg., Phila. Est. **$175,000.** CD 6/9.

†Va., Portsmouth — Yards & Docks, Navy Dpt., Wash., D. C., July 18, exten. sub-assembly shop Navy Yard, from Rust Eng. Co.; Clark Bldg., Pittsburgh, Pa., **$269,438.** CD 7/9.

CONTRACTS AWARDED

Ark., Little Rock—Judge Pulaski Co., hospital. **WPA. $300,000.**

★**†Calif., Oakland**—Navy Dpt., 18 St. and Constitution Ave., N.W., Wash., D. C., additional storage facilities, Naval Supply Depot, Oakland, and Marine Corps Depot of Supplies, San Francisco, Contr. 4865, to Clinton Constr. Co., 923 Folsom St., San Francisco, Dinwiddie Constr. Co., Crocker Bldg., San Francisco, Monson Bros., 475-6 St., San Francisco, and Duncanson-Harrelson, DeYoung Bldg., San Francisco **$7,337,000,** cost-plus-fixed-fee-basis.

†Calif., San Diego—Headquarters, 11 Naval Dist., foot of Bway., exten. Naval warehouse, 7 story, rein.-con., to C. L. Hoskins, 1764 Kettner Blvd., **$240,000.** Bids 7/17. CD 7/7.

Calif., Wilmington—Los Angeles City Dpt. Water & Power, 207 S. Bway., Los Angeles, building and machine fdns., Harbor Steam Plant, Spec. 3845, to C. L. Peck, 223 H. W. Hellman Bldg., Los Angeles, **$99,200.** Bids 7/23, awarded 7/24.

†Fla., Jacksonville—Yards & Docks, Navy Dpt., Wash., D. C., 14 officers quarters, to Fred Howland, Inc., Postal Bldg., Miami, **$178,519.** Bids 7/23. CD 7/14—ENR 7/17.

★**†Ga., Augusta**—Con. Q.M., 101 Marietta Bldg., Atlanta, triangular division camp, to J. A. Jones Constr. Co., 209 W. 4 St., Charlotte, N. C., Smith-Pew Constr. Co., 2117 Piedmont Rd., Atlanta and MacDougald Constr. Co., Northside Dr., Atlanta, **$22,800,000.** CD 5/28—ENR 6/5.

†Ga., Fort Benning—Con. Q.M., 13 regimental chapels, to Upchurch Constr. Co., Inc., 112 N. McDonough St., Montgomery, Ala., **$192,750.** Bids 5/23, awarded 6/3. CD 4/22—ENR 4/24.

†Ga., Macon—Con. Q.M., 110 Oglethorpe St., Macon, 115 demountable defense houses, near Camp Wheeler, to D. W. McCowan, Macon, **$320,505.** Bids 7/11.

★**†Ind., South Bend**—Studebaker Corp., South Bend, engine test building, to Consolidated Constr. Co., 9 S. Clinton St., Chicago, Ill., **$1,790,000.** Defense Plant Corp. will finance. CD 6/6—ENR 6/12, under Industrial Buildings.

★**†Ia., Des Moines**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., rehabilitation Fort Des Moines as induction center. **WPA. $1,388,000.**

La., Baton Rouge—East Baton Rouge Housing Auth., 607 La. Natl. Bank Bldg., Housing Projects La. 3-1 and La. 302, 80 dwelling and 50 dwelling units, etc., to J. F. Meeks Lumber Co., Inc., Choctaw Blvd., **$409,772.** Awarded 7/25. CD 7/23—ENR 6/12.

Mass., Allston (sta. Boston) — Commonwealth of Masachusetts, U. S. Property & Disbursing Officer, State House, Boston, 69x254 ft. and 69x158 ft., brick, cast stone, motor storage garage, concrete fdn., to Etcoff Constr. Co., 1318 Beacon St., Brookline, **$49,713.** A. W. K. Billings, Jr., 126 Newbury St., Boston, archt. Cleverdon, Varney & Pike, 46 Cornhill, Boston, engrs. Bids 6/12. CD 6/9.

Mich., Flint—Michigan State School for the Deaf, Flint, general contract 2 story, bsmnt., steel frame, concrete service building for School for Deaf, plain fdn., to Sorenson & Gross Constr. Co., Flint. Est. **$160,000.** CD 3/11—ENR 3/13.

★**†Mich., Ypsilanti**—Ford Motor Co., 3674 Schaefer Rd., Dearborn, superstructure 1 and 3 story, 500x1,208 ft. and 700x3,200 ft. steel, rein.-con. bomber plant, to Bryant & Detwiler Co., 2340 Penobscot Bldg., Detroit, **$31,961,300, $15,658,871** additional for equip. Defense Plant Corp. will finance. CD 4/24—ENR 5/1 under CA.

★**†Miss., Flora**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., bagloading project, to Charles Weaver Constr. Co. & Assoc., Tower Bldg., Jackson, S. & W. Co., Shrine Bldg., Memphis, Tenn., and Eastern Constr. Co., Winston Salem, N. C. Est. $15,000,000. General Tire & Rubber Co., 1708 E. Market St., Akron, O., will operate. Awarded 7/26.

†Neb., Omaha—Con. Q.M., Fort Crook, buildings, utilities for motor repair shop, to Parson Constr. Co., 701 N. 20 St., **$90,062.** CD 4/28—ENR 5/1.

†N. J., Fort Dix—Quartermaster General, Wash., D. C., additional hospital facilities, officers quarters, mess, barracks, recreation room, etc., to Thompson Constr. Co., 11 N. Pearl St., Albany, N. Y. **$333,333.** Bids 6/30. CD 6/4.

†N. J., Fort Dix—Con. Q.M., ordnance shop, boiler house, warehouses, water and sanitary sewerage sys., Bids 6/28, awarded to O'Driscoll & Grove, Inc., 247 Park Ave., New York, N. Y. **$109,748.**

★**†N. J., Fort Dix**—Con. Q. M., 3rd and 4th Echelon motor repair shops, to O'Driscoll & Grove, 247 Park Ave., New York, N. Y. **$594,000.** Awarded 7/8.

†N. J., Metuchen — Con. Q.M., Raritan Arsenal, packing, shipping, and receiving buildings, to Slonk Constr. Co., 32 Decker St., Elizabeth **$87,432.**

★**†O., Dayton**—U. S. Eng., Wright Field, ordnance warehouses and office buildings. WPA. **$884,597.**

†Okla., Oklahoma City—Con. Q.M., automotive repair shop service building, oil house, 3 truck shelters, to E. B. Bush Constr. Co., 3500 W. Reno St., Oklahoma City. **$46,213.** CD 6/30—ENR 7/3.

†Ore., The Dalles—U. S. Eng., 628 Pittock Blk., Portland, warehouse and file building, Big Eddy Lock, to McWilliams Dredging Corp., 180 N. Michigan Ave., Chicago, Ill., **$195,554.** Bids 6/27, awarded 7/3. CD 6/10—ENR 6/12.

★**†Pa., Harrison Twp.**—Allegheny County Housing Auth., 201 County Office Bldg., Pittsburgh, brick, veneer housing 200 families, Sheldon Park, for FWA, to Henry Shaffer Lumber Co., Kittaning, **$862,450.** CD 7/18—ENR 7/24.

★**†Pa., Heidelberg**—Allegheny Co. Housing Auth., 201 County Office Bldg., Pittsburgh, 250 families Chartiers Terrace Defense Housing, for FWA, to G. Dreyman Inc., 8 Pier St., Long Island City, N. Y. **$850,101.** CD 7/17—ENR 7/24.

★**†Pa., North Braddock**—Allegheny Co. Housing Auth., County Office Bldg., Pittsburgh, Braddock Heights Defense Housing, 200 families, to Siesel Constr. Co., Flannery Bldg., Pittsburgh, **$833,400.** CD 7/18—ENR 7/24.

★**†Pa., Shaler Twp.**—Allegheny Co. Housing Auth., 201 County Office Bldg., Pittsburgh, Shalercrest Defense Housing, 250 families for FWA, to Madsen Constr. Co., 1790 Lyndale Ave. S., Minneapolis, Minn., **$1,008,091.** CD 7/18—ENR 7/24.

★**Tex., Alibene**—W. W. Hair, Bd. Educ., plans by David S. Castle Co., 1082½ N. 1 St., school imprvs., 2 junior high schools, repairing Alta Vista and Locust Schools (Tex. 41-142). **$540,000.** Application filed for PWA funds.

†Tex., Brownwood—Con. Q. M., Camp Bowie, 8 motor sheds open bays and 12 motor sheds closed bays, to Hickey & Co., Construction Bldg., Dallas. **$129,500.**

†Tex., Denison—National Youth Administration, 2145 C St., N.W., Wash., D. C., mechanical shop training school plant, Purchase and Hire, about **$100,000.**

†Tex., Grand Prairie—U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., testing and garage building, Airplane Assembling Plant, to James Stewart & Co., 230 Park Ave., New York, N. Y., **$100,000.** Allen & Kelley, 634 Architects & Builders Bldg., Indianapolis, Ind., archts.

★**†Va., Norfolk**—Norfolk Housing Auth., 300 unit defense housing, for USHA to William Muirhead Constr. Co., Inc., Durham, N. C. **$1,084,000.** Bids 7/14. Awarded 7/22. CD 7/9.

†Wash., Fort Lewis—Con. Q.M., 30 temporary buildings, water and sewer facilities, electric distr. sys., to MacDonald Building Co., 1517 Tacoma Way, Tacoma, **$285,260.** Awarded 6/28.

†Wash., Fort Lewis—Con. Q.M., ordnance shop, boiler house, ordnance warehouse, to J. W. Bailey, 228 Ninth Ave. N., Seattle, **$94,600.** CD 6/24—ENR 6/26.

★**†Wash., Seattle**—Con. Q. M., 1519 S. Alaskan Way, 4 story, rein.-con. warehouse, Seattle Quartermaster Depot, to Western Constr. Co., Textile Tower, **$1,525,450.** Bids 6/28. CD 7/1—ENR 7/10.

★**†Wash., Spokane**—Aluminum Co. of America, Gulf Bldg., Pittsburgh, Pa., design and construct aluminum plant, own forces. **$9,000,000.** Union Carbide & Carbon Co., 3411 N. Columbia Blvd., Portland, Ore., will operate, Defense Plant Corp. will finance.

★**†Wash., Tacoma**—Aluminum Co. of America, Gulf Bldg., Pittsburgh, Pa., design and construct aluminum plant, own forces, **$5,000,000,** Olin Corp., Koppers Bldg., Pittsburgh, Pa., will operate. Defense Plant Corp. will finance.

N. S., Halifax—Secretary Dpt. Munitions & Supply, Ottawa, Ont., frame buildings at Wellington Barracks, to R. and A. Parsons, Windsor. **$219,000. (Correction**—contract figure.) CD 7/14—ENR 7/17, under CA.

★**N. S., Halifax**—Dpt. National Defense for Sea, Ottawa, Ont., permanent buildings, Wellington Barracks, to Anglin-Norcross, Maritime, Ltd., 892 Sherbrooke St. W., Montreal, Que., and Halifax, N. S., about **$700,000.**

Ont., Windsor—Utilities Comn., O. M. Perry, mgr., Canada Bldg., 2 brick, steel, concrete Wyandotte and Seminole substations, to Allan Constr. Co., 44 Wyandotte St. E. Est. **$141,414** and **$63,579** respectively. Bids about 7/11, awarded 7/18. CD 6/24—ENR 6/26.

Sask., Regina — Van Egmond & Storey, archts., McCallum Bldg., hospital addn., to Smith Bros. & Wilson Ltd., 105 Dominion Bank Bldg., for Grey Nuns of the Cross, Deadney St. **$160,000.** CD 7/2—ENR 7/10.

COMMERCIAL BUILDINGS

PROPOSED WORK

Conn., Darien—B. McL. Quackenbush, Leroy Ave., moderately priced homes, 9 acre plot, Fanshaw Rd. $150,000. FHA.

Conn., West Hartford—Tychsen Brother, 956 Asylum Ave., residential development, 30 acres, Over $150,000. FHA.

Fla., Lakeland—Florida Natl. Bank, Lakeland, soon lets contract banking building. $150,000.

Ill., Rock Island—St. Anthony's Hospital, hospital addn. $200,000.

Ia., Fort Madison—Mark C. Storms, Fort Madison, 39 homes. $150,000.

Nev., Las Vegas—Sears, Roebuck & Co., W. Arthington and S. Homan Sts., Chicago, Ill., plans by A. L. Worswick, assoc. archt., Las Vegas, 2 story, 125x130 ft., department store. $200,000.

N. J., Elizabeth—Owner, c/o Levy & Pelton, archts., 29 Broad St., 2 story, bsmnt., 110x200 ft., brick, concrete block store, Broad St. $175,000.

N. J., Newark—S. Bratter, 790 Broad St., plans by W. E. Lehman, 972 Broad St., 2 story, bsmnt., brick, steel store and office bldg., Broad St. $200,000.

N. J., Nutley—Economy Built Homes, Inc., 61 Washington St., Bloomfield, plans by W. Boyd, 52 Rossemere Pl., Belleville, sixty-five 1½ and 2 story, bsmnt. homes, Hope St. $390,000.

N. J., Red Bank—Walter Reade Circuit, 701 7 Ave., New York, plans by W. I. Hohauser, 1841 Bway., New York, 100x250 ft., brick, steel theatre, Broad St. Over $150,000.

N. Y., New York—R. F. Leo, 230 Manida St., plans by G. G. Miller, 67 W. 44 St., 6 story, 150x165 ft. apartment, Morris Ave. and 191 St. $350,000.

★**N. Y., New York**—Syndicate, c/o G. S. Swiller, archt., 535 E. Tremont Ave., three 6 story apartments, on block bounded by Sedgewick Ave., Kingsbridge Terrace, 230 and 231 Sts., separate contracts. $800,000. CD 6/24—ENR 6/26.

N. Y., New York—Lisbon Realty Corp., 3527 Jerome Ave., plans by H. H. Lilien, 215 E. 149 St., 6 story, 79x150 ft. apartment, 205 St. near Mosholu Parkway. $225,000.

O., Cleveland—St. Lukes Hospital, Dr. F. G. Carter, supt., E. 116 St. and Buckeye Rd., plans by Hubbell & Beneo Co., 4500 Euclid Ave., 3 story, bsmnt., 74x162 ft., brick, steel, concrete service bldg. $175,000.

O., Columbus—W. H. Davis, 1865 S. High St., 62 dwellings. $248,000.

O., Columbus—Sigma Alpha Epsilon Fraternity, 1934 42 Indianala Ave., A. Wise, pres., plans by H. D. Smith, Brown Hall, Ohio State University, and K. W. Armstrong, 21 E. State St., 2 story, brick, stone fraternity house. $160,000.

O., Columbus—South Side Steelton Lumber Co., 1865 S. High St., about 20 homes, E. Columbus St. and 42 homes, Bexley Heights. $248,000.

★**Pa., Glenraudh (Erie P. O.)**—Smith & Root, Erie Trust Bldg., Erie, 100 unit housing, Hart Estate, 5 mi. west of Erie. $500,000.

Que., Sorel—Reverend Sisters of the Grey Nuns, 21 George St., hospital. $150,000.

COMMERCIAL BLDGS. (Continued)

BIDS ASKED

Bids Asked about August 5

Mich., Pontiac—St. Joseph Mercy Hospital, 3 story, 94x160 ft., brick, rein.-con. nurses' home, rein.-con. fdn. $200,000. Walter Butler Co., Inc., 1030 Minn. Bldg., St. Paul., Minn. S. S. Cook, Book-Cadillac Hotel, Detroit, archts.

Bids Asked August 12

Wis., Ripon—Ripon College, 1 and 2 story, 150x156 ft., rein.-con., steel, stone union building, concrete fdn. $150,000. Auler, Jensen & Brown, 46 Washington Blvd., Oshkosh, archts. CD 6/18—ENR 6/26.

Bids Asked about September 1

Tex., Dallas—Southern Methodist University, c/o Dr. Humphrey Lee, pres., 1 story gymnasium. $150,000. M. Lemmon, Tower Petroleum Bldg., archt.

Bids Asked

Pa., Pittsburgh—Darling Stores Corp., 370-7 Ave., New York, N. Y., altering women's clothing store. $150,000. S. Kavanaugh, 240 5 Ave., Pittsburgh, local mgr. in charge. Grunebaum & Krummick & Auer, 125 E. 26 St., New York, N. Y., archts.

CONTRACTS AWARDED

Calif., Los Angeles — Southern California Telephone Co., 666 S. La Brea Ave., 2 story, 105x135 ft. Whitney Bldg. addn., to Stanton-Reed Co., 816 W. 5 St., approx. **$250,000.** Bids 7/16. CD 7/16—ENR 7/17.

Calif., Millbrae—Greene Bros., San Bruno, 1 story, wood frame homes. Owner builds. Total expenditure over **$150,000.**

★ **Calif., Long Beach**—C. S. Jones & Associates, 5484 Atlantic Ave., 813 wood frame, stucco dwellings, Cherry and Atlantic Aves. Owner builds. Over **$2,000,000.** W. Woollett, 816 Architects Bldg., Los Angeles, archt.

Calif., San Francisco—Pacific Telephone & Telegraph Co., Telephone Bldg., 2 story (ultimate 5 story), bsmnt., 100x102 ft., rein.-con., steel Randolph Central Office Exchange, to Monson Bros., 475 6 St., approx. $200,000; structural steel, to Moore Dry Dock Co., foot of Adelin St., **$250,000.** CD 5/7—ENR 5/15.

Calif., San Jose—Mrs. F. B. Campen, c/o E. W. Kress, archt., 1st Natl. Bank Bldg., 2 story, brick, steel bowling alleys and concession building, to W. M. Caldwell, 1241 Hedding St., **$165,000.**

Calif., San Leandro—J. K. Pond, 111 E. 14 St., Oakland, 1 story, wood frame homes, to C. P. Pond, 111 E. 14 St., Oakland. Total expenditure over **$150,000.**

Calif., San Leandro—Bates & Railey, Bank of America Bldg., Oakland, 1 story, bsmnt., wood frame dwellings, to A. T. Beckett, 695 E. 14 St., Oakland. Total expenditure **$150,000.**

Conn., Darien—Guildway Homes, Inc., J. B. Warner, pres., 46 Atlantic St., Stamford, 20 medium priced houses, Brown and Robinson Sts. **$150,000.** Owner builds. FHA. J. L. Curcio, Rockview Pl., Cos Cob, archt.

Conn., Greenwich—Rich Brothers, 25 Wilson St., Stamford, 7 moderately priced homes, 10 acres land, Hassake Heights. **$150,000.** Owner builds.

Conn., New Britain—Shachnow & Brown, Inc., 527 5 Ave., New York, 1 story, 160x230 ft., brick, steel business bldg., Myrtle and Main Sts. **$150,000.** Owner builds. CD 4/27—ENR 5/1.

★ **D. C., Wash.**—Jerry Malatico, 831 Woodward Bldg., 8 story, bsmnt., brick, stone apartment hotel, 204 units, 3130 Wisconsin Ave. N.W. Owner builds. **$500,000.** M. G. Lepley, 5230 Nebraska Ave. N.W., archt.

D. C., Wash.—Monco Realty Co., 1414 Monroe St. N.W., eight 3 story, brick apartments, 95 units, 4027 Benton St. N.W., 2301-2307 41 St. N.W., and 2310-2316, 2322 40 St. N.W., to C. W. Gosnell, Inc., 1414 Monroe St. N.W. Est. **$162,000.** L. Chatelian, Jr., 1727 K St. N.W., archt.

La., New Orleans—Southern Bell Telephone & Telegraph Co., Hurt Bldg., Atlanta, Ga., exchange building, to L. F. Favret, 937 Gravier St. CD 7/15—ENR 7/17.

Me., Portland — Mercy Hospital, 6 story, 48x125 ft. and 5 story 46x125 ft., brick, steel, limestone, granite hospital, State St., to W. J. Lynch Co., 28 South LaSalle St., Chicago, Ill. Est. **$400,000.** Bids 6/30. CD 6/18—ENR 6/26.

★ **Mo., Independence**—M. M. Block, Victor Bldg., Kansas City, Mo., 200 one story, frame detached residences, day labor. **$800,000.** H. L. Wagner, 114 W. 10 St., Kansas City, Mo., archt.

N. J., Iselin—Home Guardian Co. of New York, 125 E. 23 St., New York, 100 one family homes, Auth Ave. Owner builds. **$400,000.**

N. J., Linden — Cameron Assn., 790 Broad St., Newark, forty 1½ story, bsmnt., 25x40 ft. homes Wood Ave., separate contracts. **$180,000.** S. L. Klien, 790 Broad St., Newark, archt. CD 7/16—ENR 7/24.

N. J., Norwood—Pegasus Park, 551-5 Ave., New York, six hundred 1½ story, bsmnt., brick veneer, wood frame homes, Everett Park, separate contracts. **$300,000.** E. C. Bullock, 235 E. 73 St., New York, archt.

N. Y., Flushing — Superb Builders, Inc., 144-54 Jewel Ave., 38 one family homes, Main St. and 70 Ave. Owner builds. **$188,350.** M. Rothstein & Son, 391 Fulton St., Brooklyn, archts.

N. Y., Flushing—Selby Homes Corp., 274 Maidson Ave., New York, thirty-three one family homes, Parsons Blvd., Blvd. and 59 Ave. Owner builds. **$150,000.** O. F. Silverstone, 153 Pierrepont St., Brooklyn, archt.

★ **N. Y., Flushing**—Hemingway Homes, Inc., 91-28 181 St., Pamaica, 110 one family homes, Jewel Ave. and Utopia Parkway, (first group comprising 16 homes). Owner builds. **$500,000.** W. Sambur, 160-16 Jamaica Ave., Jamaica, archt.

N. Y., Flushing—Princeton Developing Corp., 16 Court St., Brooklyn, 6 story apartment, 103-26 88 Rd., separate contracts. **$385,000.** P. Birnbaum, 303 W. 42 St., New York, archt. CD 7/14—ENR 7/17.

N. Y., Forest Hills—Bryant Gardens, Inc., 51 E. 42 St., New York, 50 one family homes, 63 Rd. and 99 St. Owner builds. **$225,000.** W. Sambur, 160-16 Jamaica Ave., Jamaica, archt.

N. Y., New York—Redemptionist Fathers of New York, 526 57 St., Brooklyn, altering 3 story, brick, school and 2 story roof addn., to Leopold Neckermann, Inc., 205 E. 42 St. Est. **$150,000.** CD 7/18—ENR 7/24.

O., Cincinnati—First Natl. Bank of Cincinnati, 4 and Walnut St., H. L. Leyman, chn. bd., modernizing, remodeling bank bldg., to Ferro Concrete Constr. Co., Third and Elm Sts. Approx. **$200,000.** C. Ferber, 1st Natl. Bank Bldg., archt. Fosdick & Hilmer, Union Trust Bldg., engrs.

O., Ashland—Schine Circuit, Inc., 630-5th Ave., New York, general contract delux theatre, 1,400 seating capacity, Center St., to Clarence L. Knowlton, 317-18 Bank of Wood County Bldg., Bowling Green, **$150,000.** Bids 6/5, awarded 7/2. CD 6/4—ENR 6/12.

O., Oberlin—Oberlin College, 2 story, bsmnt., 59x194 ft., Italian Romanesque, material stone physics bldg., N. Professor St., to Cleveland Constr. Co., 1228 Terminal Tower Bldg., Cleveland, **$390,000.** E. J. Schulte, 920 E. McMillan St., Cincinnati, archt.

Pa., Washington—P. C. Dowler, archt., 803 Century Bldg., Pittsburgh, general contract and electrical work, 3 story, bsmnt., 42x86 ft., brick, hollow tile hospital addn. and nurses' home, for Washington Hospital, W. E. Barron, supt., Leonard Ave., to Washington Eng. & Constr. Co., Pa. and Oakland Aves.; plumbing, steam heating, to McVehil Plumbing Co., 40 E. Wheeling St. Est. **$200,000.** Bids 7/22. CD 6/8—ENR 7/10.

Pa., West View (br. Pittsburgh)—St. Athanasius Church, A. A. Vogel, pastor, native stone church, Chalfant Ave., separate contracts. **$150,000.** W. H. Norris, supt. in charge constr. E. J. Hergenroeder, 1357 Lowrie St., Pittsburgh, archt.

INDUSTRIAL BUILDINGS

PROPOSED WORK

Calif., Emeryville — PLANT — W. P. Day, archt., Financial Center Bldg., San Francisco, soon lets contract, plant addns. for Hubbard & Co., 1250 45 St. Over $50,000.

Calif., Fresno — PLANT — Western Turkey Packing Co., c/o G. N. Hilburn, 1211 K St., Modesto, 1 story, concrete, wood frame packing plant. $40,000.

Calif., Redwood City—TERMINAL—W. D. Peugh, archt., 333 Montgomery St., San Francisco, soon lets contract, 1 story, rein. con. bus and buggage terminal, for Pacific Greyhound Lines, 5 and Mission Sts., San Francisco. $40,000.

Calif., San Francisco—SHOP—M. Desiano, 2453 Lombard St., plans by H. C. Baumann, 251 Kearny St., 2 story wood frame shop. $40,000.

Calif., San Francisco—PLANT—K. Theill, engr., 580 Market St., soon lets contract, rein.-con., brick meat packing plant addns., for Safeway Stories, Inc., Wisconsin and 18 Sts. Over $40,000.

Calif., San Francisco—WAREHOUSE—Miller & Warnecke, archts., Financial Center Bldg., Oakland, soon lets contract 1 story, rein.-con. warehouse and 2 story, rein.-con. administration unit, for Pacific Vegetable Oil Corp., 62 Townsend St. Over $80,000. CD 5/7—ENR 5/15.

Calif., San Mateo—FREIGHT TERMINAL—J. Robertson, 559 6 St., San Francisco, freight terminal, $40,000 or more.

Calif., Saratoga — WINERY — Paul Masson Winery, rebuilding winery, destroyed by fire. Over $40,000.

Conn., Bridgeport—PUBLISHING PLANT—Bridgeport Herald Corp., 299 Lafayette St., 2 story, 100x110 ft. brick plant addn., Lafayette St., $65,000.

Conn., Bridgeport — PLANT — Remington Rand, Inc., 1087 Railroad Ave., brick, steel plant addn., Remtico Plant. $100,000.

Fla., Jacksonville—PLANT—Filtered Rosin Products, Inc., W. T. Kelley, vice pres. in charge, Beaver St. and Lanes Ave., manufacturing plant. $100,000.

★ **Ill., East Peoria (Peoria P. O.)**—PLANT—Caterpillar Tractor Co., 600 W. Washington St., tractor plant addns., imprvs. $592,000. (**Correction**—location of project.) CD 7/10—ENR 7/17, under East St. Louis.

★ **Ind., Jeffersonville**—MANUFACTURING—Colgate-Palmolive-Peet Co., part 2 and 4 story, brick manufacturing bldg. $500,000. B. A. Pawlik, c/o owner, engr.

Me., Bangor—GARAGE—Bean & Conquest, Summer St., plans by P. C. Atwood, c/o Prentiss & Carlisle, Hammond St., 2 story, 100x210 ft., steel, brick garage, Davis St. $60,000.

Me., Portland—POWER PLANT — Cumberland County Power & Light Co., 443 Congress St., sketches brick, steel, concrete power plant addn., Knightville St., steam generating sys., transformer station, Highland Ave., and transmission lines. Over $40,000.

Me., South Portland—FACTORY—Seaboard Packing Co., 215 Front St., plans by A. J. Harriman, Front St., 2 story, bsmnt., 40x100 ft. sardine canning factory; 2 story, bsmnt., 80x404 ft. warehouse, both timber concrete fdn., Front St.

Md., Baltimore—POWER PLANT—Morgan State College, Hillen Rd. and Arlington Ave., plans by L. E. D. Gaudreau, 327 N. Charles St., 1 story, 40x80 ft. power plant. $80,000.

Md., Baltimore—FACTORY—Md. Bolt & Nut Co., Smith Ave. near Falls Rd., 1 story, 62x200 ft., brick, steel, factory, to Cummins Constr. Co., 803 Cathedral St. $50,000.

Md., Ellicott City — FACTORY — Baltimore Properties, Inc., 313 E. Baltimore St., Baltimore, rescinded contract rebuilding 2 and 3 story, 110x300 ft., rein.-con. brick factory, incl. new machine shop and warehouse. $200,000. Doughnut Corp. of America, c/o owner, lessee. CD 7/1—ENR 7/10, under CA.

Mich., Adrian—PLANT—American Chain & Cable Co., W. J. Wisner, mgr., 1 story, brick, steel, concrete plant addn., plain fdn. $50,000.

Mich., Detroit—PLANT—Lyon, Inc., 197 S. Waterman St., 1 story, 200x500 ft., rein.-con., brick, metal plant, plain fdn. Smith, Hinchman & Grylls, 800 Marquette Bldg., engrs.

Mich., Greenville—FOUNDRY—Federal Moquel Corp., 1 story, brick, steel, concrete foundry. $113,000.

Mo., St. Louis—DAIRY PLANT—St. Louis Dairy Co., 2001 Chestnut St., dairy plant on 109x169 ft. site, 21 and Pine Sts. $40,000.

Mo., St. Louis — WAREHOUSE — American Smelting & Refining Co., Federated Metal Div., 4041 Park Ave., soon lets contract, 1 story, 82x120 ft., brick, steel warehouse addn., rein.-con. fdn. Murphy & Wishmeyer, archts., and N. Campbell, engr., both Bd. Educ. Bldg., Locust St. CD 7/21—ENR 7/24.

N. J., Hanover—CHEMICAL, etc.—Maltbie Chemical Co., 240 High St., Newark, soon lets contract 1 story, 32x90 ft., brick, steel chemical mfg. bldg. and laboratory. V. M. Reynal, 360 Main St., East Orange, archt. O. Vogelbach, 650 Broadway, Newark, engr.

N. J., Newark — WAREHOUSE — L. W. Colings Co., c/o C. G. Poggi, archt., 287 Morris Ave., Elizabeth, 1 story, 50x100 ft., brick warehouses, Frelinghuysen Ave., McLeod & Ferrara, 287 Morris Ave., engrs.

N. Y., New York—GARAGE—H. Dressel, 718 E. 134 St., plans by A. M. De Rose, 370 E. 149 St., 1 story, 106x125 ft. garage, 134 St. near Willow Ave. $40,000.

O., Cleveland—FACTORY—Jent Machine Co., D. Jent, pres., Richmond Rd., soon lets contract, 1 story, 50x122 ft. factory, 11x25 ft. boiler room, brick, steel, $40,000. J. L. Rodrick, 1850 Superior Ave., archt.

★ **O., Dayton**—PLANT—Frigidaire Div., General Motors Corp., 300 Taylor St., bids soon 1 story, brick, steel assembly and parts mfg. plant, plain fdn. $1,000,000. Schenck & Williams, Winters Bldg., archts.

O., Ohio City—BUS TERMINAL—Central Greyhound Lines, Inc., R. W. Budd, pres., Cicero, Ill., plans by Wichmeyer, Arrasmith & Elswick, Heyburn Bldg., Louisville, Ky., 2 story, brick, concrete bus terminal. $200,000.

Pennsylvania—MILLS—R. A. Smith, et al, Tyrone, chain of lumber mills, various locations, Clearfield, Elk and Jefferson Counties. Over $150,000.

Pa., Allentown—SUPER-SERVICE STATION—Gulf Refining Co., Gulf Bldg., Pittsburgh, and Allentown, C. G. Drasher, div. mgr., master super-service station on 100x120 ft. site, 7 and Tilghman Sts. $75,000.

Pa., Harmon — FACTORY — Fox Grinders, Inc., J. B. Bair, treas., 1704 Oliver Bldg., Pittsburgh, 1 story, 50x100 ft., steel, concrete manufacturing unit. Over $40,000.

S. D., Belle Fourche—PLANT—Eastern Clay Products, Inc., Eifert, O., 16x24 ft., 50x125 ft. and 50x120 ft. bentonite plant. $50,000.

★ **Tex., Abernathy**—POWER PLANT—Texas-New Mexico Utilities Co., Abernathy, 20,000 kw. steam power plant. $2,500,000.

★ **Tex., Borger**—POWER PLANT—Panhandle Light Co., Borger, 20,000 kw. steam power plant. $2,640,000.

Tex., Denison—REPAIR SHOP—Missouri-Kansas Texas Ry. Co., Railway Exch. Bldg., St. Louis, Mo., F. Ringer, ch. engr., expanding railway car repair shops, etc. $150,000 or more.

Tex., Waco—REPAIR SHOP FACILITIES—Missouri-Kansas Texas Ry. Co., Railway Exch. Bldg., St. Louis, Mo., F. Ringer, ch. engr., expanding repair shop facilities. $90,000.

★ **Utah, Garfield**—PLANT—Utah Copper Co., G. Earl, ch. engr., Kearns Bldg., Salt Lake City, 75,000 kw. steam electric plant. $5,000,000.

Wash., South Bend—SAW MILL—American Lumber & Shingle Co., sawmill, to replace burned structure. $40,000.

Wis., Ellsworth — CREAMERY — Ellsworth Creamery Co. plans by Klinger & Hubbard, 218 S. Barstow St., Eau Claire, 1 story, part bsmnt., 41x122 ft., steel, brick creamery, concrete fdn.

Wis., Milwaukee—WORKSHOP — State Bd. Control, Madison, plans by R. C. Kirchhoff, state archt., Madison, 2 story, 40x160 ft. workshop for blind.

Wis., Rochester—WAREHOUSE, etc.—Racine Co., soon lets contract 1 story, 80x124 ft. and 32x36 ft., concrete blocks, steel warehouse and garage, $40,000. E. A. Klinger, 614-14 St., Racine, archt. E. R. Fischer, co. engr.

★ **Alta., Calgary**—OIL REFINERY—McColl-Frontenac Oil Co. Ltd., 1010 St. Catherine St. W., Montreal, Que., bids soon oil refinery. $1,000,000.

Ont., Hamilton — FOUNDRY — Hamilton Munitions Ltd., J. P. Mills, secy., Hamilton, foundry. $50,000.

INDUSTRIAL BLDGS. (Proposed Work, Continued)

★ **Ont., Ottawa** — BREWERY — Canadian Breweries, Ltd., O'Keefe House, Victoria St., Toronto, plans by T. G. Ferguson, c/o owner, and bids soon imprv. existing Brading Breweries, Ltd. plant, Wellington St. $100,000. Total est. new buildings, equip. $1,000,000.

Ont., St. Catherine—FACTORY—L. Hesson, archt., 309 St. Paul St., soon lets contract, 1 story, 35x107 ft., brick, tile factory addn., for Packard Electric Co., 13 Race St. $60,000. Structural steel, awarded to Standard Steel Constr. Co., Port Robinson.

★ **Ont., Toronto** — PLANT — C. G. Maclean, archt., 9 Sultan St., Toronto, bids soon overhaul and repair plant, test flight hangars, hard-surfacing portion of 1 runway at North York, near here, for De Havilland Aircraft of Canada, Ltd., North York. About $500,000. D. Shephard, 57 Bloor St. W., Toronto, engr.

BIDS ASKED

Bids Asked August 5

Mass., New Bedford—BOTTLING PLANT—Coca Cola Bottling Co., 437 Kempton St., 1 story, brick, steel bottling plant, Kempton St. $65,000. J. M. Shelton, Bona Allen Bldg., Atlanta, Ga., engr. CD 3/19—ENR 4/3.

Bids Asked about August 26

Mass., East Springfield—PLANT—Westinghouse Electric & Mfg. Co., 633 Page Blvd., brick, steel Bldg. addn. Over $40,000.

Bids Asked

Calif., Berkeley—PLANT—Linde Air Products Co., Berkeley, Calif., and 30 E. 42 St., New York, N. Y., (selected list bidders), 1 story, 80x150 ft., brick, steel plant.

Calif., Vallejo—BUS TERMINAL—C. E. Perry, archt., 512-A Marin St., 1 story, brick, concrete motor bus terminal, for San Francisco & Napa R. R., 724 Soscol Ave., Napa, $40,000. CD 5/23—ENR 5/29.

Conn., Hartford—GARAGE—Southern New England Telephone Co., 227 Church St., New Haven, superstructure 1 story, 70x100 ft. brick, steel, concrete service garage, Albany Ave. $55,000. R. W. Foote, 157 Church St., New Haven, engr. Foundations, from Raymond Concrete Pile Co., 140 Cedar St., New York. CD 7/22—ENR 7/24.

Mich., River Rouge—PLANT—Ford Motor Co., Dearborn, 4 story, 360x400 ft. aircraft plant addn. Giffels & Vallet, 1000 Marquette Bldg., Detroit, engrs. CD 5/19—ENR 5/22.

N. Y., Brooklyn—WAREHOUSE, etc.—Brillo Mfg. Co., 205 Water St., altering 4 story warehouse and office bldg., 183-85 Plymouth St. $40,000. S. Goldstone, 285 Madison Ave., New York, archt. CD 7/16—ENR 7/24.

N. Y., Canastota — PLANT — Queensboro Farm Dairy Products Co., 35-13 41 St., Long Island City, pasteurizing plant. $110,000. W. Fuehrer, 505 5 Ave., New York, archt.

Ont., Kitchener—MACHINE SHOPS—J. C. Klaehn, archt., 49 King Arthur St., 1 story, 65x100 ft., brick, steel machine shops. $45,000.

LOW BIDDERS

Ala., Greenville—FACTORY—Merrimac Hat Corp., B. F. Sargent, pres., Greenville, July 18, 2 story, brick hat factory, from Riley Bros., Greenville, **$79,990.**

N. Y., Wellsville—PLANT—Moore Steam Turbine Corp., Harrison, N. J., 2 story, 36x75 ft. plant addn., from Vossler & Vossler, Wellsville. Est. **$40,000** with equip.

CONTRACTS AWARDED

Ala., Birmingham—CAR SHOPS—Tennessee Coal, Iron & R.R. Co., Brown-Marx Bldg., 1 story, 130x260 ft., steel car shop, 50x160 ft. steel fabricating shop, etc., day labor. **$87,000.**

Calif., Burbank—ASSEMBLY, etc.—Lockheed Aircraft Corp., 1705 Victory Pl., 1 story, 27x134 ft. assembly and storage bldg. 80x180 ft. shop, to H. W. Baum & Co., 232 S. Van Ness Ave., Los Angeles, approx. **$50,000.** Parkinson & Parkinson, Title Insurance Bldg., Los Angeles, archts.

Calif., Fresno — GARAGE — Carnie Co., Fresno, brick, steel garage, to Ericson & House, Box 540, Rt. 9, **$45,400.** Franklin & Kump, Patterson Bldg., archts.

Calif., Los Angeles—MOULD LOFT, etc.—Los Angeles Shipbuilding Co., 2 story, 170x550 ft. mould loft and warehouse, west basin, Los Angeles Harbor, to E. S. McKittrick Co., 7839 Santa Fe Ave., Huntington Park. **$343,278.** Awarded 7/25. E. I. Hietschmidt, 807 Subway Terminal Bldg., archt. R. E. Phillips, 816 W. 5 St., engr.

Calif., Los Angeles—WAREHOUSE—Zellerbach Paper Co., 3000 E. 12 St., 182x221 ft. warehouse addn., to Austin Co., 777 E. Washington St., approx. **$42,000.** CD 7/15— ENR 7/17.

Calif., Oakland—PLANT—Chemicals, Inc., 32 and Wood Sts., plant addns., to H. E. Rahlmann, 251 Kearny St., San Francisco. Est. over **$40,000.** H. C. Baumann, 251 Kearny St., San Francisco, archt.

Calif., Watsonville—PLANT—H. J. Heinz Corp., Watsonville, plant addns., new press room, sewerage sys. to K. S. Friend, 119 E. Lake Ave., guaranteed fixed cost basis. Est. over **$50,000.**

Calif., Watsonville—WAREHOUSE—Appleton Products Co., Watsonville, 120x200 ft., concrete, wood frame warehouse, to R. S. Friend, 119 E. Lake Ave. **$42,360.**

Conn., East Hartford — DYNAMOMETER — Pratt & Whitney Div., United Aircraft Corp., 400 Main St., 1 story, brick, steel dynamometer bldg., to Wadhams May & Carey Co., 15 Lewis St., Hartford. Est. over **$40,000.** CD 5/23—ENR 5/29.

Conn., Waterbury — FACTORY — Chromium Corp. of America, Inc., Brown Rd., 1 story, 50x180 ft., brick, steel factory addn., to Oscar Stroberg & Son, 649 Watertown Ave. Est. **$40,000.**

Ga., Columbus—MILL—Eagle-Phoenix Mills, 4 story, rein.-con., steel, brick mill addn. and alterations, to Williams Lumber Co., Columbus, **$300,000.** J. E. Sirrine & Co., Greenville, engrs.

Ind., Indiana Harbor — FURNACE — Inland Steel Co., 38 S. Dearborn St., Chicago, Ill., blast furnace, to Arthur G. McKee Co., 2422 Euclid Ave., Cleveland, O.

Ia., Ottumwa — WAREHOUSE, etc. — Dain Mfg. Co., Ottumwa, 5 story warehouse and office and display buildings, to W. A. Klinger, Inc., 301 Warnock Bldg., Sioux City. **$153,000.**

Mass., Cambridge—PLANT—Blanchard Machine Co., 64 State St., Boston, 1 story, 45x78x90 ft., brick plant addn., Osborne St., to J. W. Bishop Co., 100 Erie St., **$45,000.**

Mass., Hyde Park—PLANT—B. F. Sturtevant Co., 89 Broad St., Boston, 3 story, bsmnt., 45x62 ft. and 15x30 ft., brick stone plant addn., to R. R. Jacobucci, Inc., 16 Greenwood Ave., Quincy. Est. **$40,000.** CD 4/11—ENR 4/17.

Mass., Worcester—GARAGE, etc.—Sun Oil Co., 835 Statler Bldg., Boston, 1 story, 71x80 ft., and 27x41 ft. brick garage, office and service station, concrete fdn., to Mauro Constr. Co., Inc., 601 Turks Head Bldg., Providence, R. I., approx. **$40,000.** CD 7/1—ENR 7/17.

Mass., Worcester—POWER SUBSTATION—American Steel & Wire Co., South Works, Worcester, brick, steel, concrete power substation, Ballard and Millbury Sts., to M. J. Dyer & Co., 58 Front St., Est. **$40,000.** CD 6/16—ENR 6/19.

Mich., Kalamazoo—STORAGE, etc.—Kalamazoo Vegetable Parchment Co., 1 story, 100x350 ft., brick, steel, concrete building for storage and shipping, plain fdn., to Miller-Davis Co., Kalamazoo. Est. **$65,000.**

Mich., Lansing—MANUFACTURING—General Motors Corp., General Motors Bldg., Detroit, manufacturing building, to Christman Co., 408 Kalamazoo St. **$151,125.**

Mich., Pontiac—MANUFACTURING—Baldwin Rubber Co., 366 E. South St., 2 story, bsmnt., 95x273 ft., brick, steel, rein.-con. mat manufacturing building, plain fdn., to Darin & Armstrong, 2041 Fenkell Ave., Detroit. Est. **$150.000.** L. J. Heenan, 609 Peoples State Bank Bldg., archt.

Mich., Pontiac — WAREHOUSE — Pontiac Daily Press, 1 story, 60x200 ft. steel, concrete warehouse, to H. L. Stout, 21 Genessee St. Est. **$40,000.** W. C. Zimmerman, 838 Richter Bldg., Pontiac, archt.

Mo., St. Louis—FACTORY—G. H. Packwood Mfg. Co., 2038 Walnut St., 2 and 3 story, 27x70 ft., brick factory addn., to W. C. Harting Constr. Co., 722 Chestnut St. Est. **$40,000** with equip. F. R. Naumann, 2700 N. Grand Blvd., archt.

N. Y., Long Island City—STORAGE—Long Island R.R. Co., Penna. Sta., New York, C. E. Adams, ch. engr., 1 story, storage and freight office, 47-27 Arch St., to Salson Constr. Corp., 89-31 161 St., Jamaica. Est. **$40,000.** CD 7/18—ENR 7/24.

N. C., Stanley—PLANT—Stanley Mills, Inc., Stanley, 2 story, 100x200 ft. plant addn., to Herman Sipe & Co., Conover, N. C. J. E. Sirrine & Co., Greenville, S. C., consult. engrs.

N. D., Fargo—WAREHOUSE—Dakota Tractor & Equipment Co., general contract 1 story, 103x154 ft., concrete, steel warehouse and parts building, to Meinecke-Johnson Co., Fargo. Est. **$75,000.** CD 11/8—ENR 11/14.

O., Cincinnati—FACTORY—Corcoran-Brown Lamp Co., 4864 Spring Grove Ave., factory addn., to Frank Messer & Sons, Inc., 2515 Burnet Ave., approx. **$100,000.**

O., Columbus — LABORATORY — Trustees Battelle Memorial Institute, J. C. Miller, pres., 505 King Ave., 4 story, 70x105 ft., brick, rein.-con. laboratory addn., to G. Reibel, 1782 Franklin Ave., approx. **$150,000.** D. A. Carmichael, 5 E. Long St., archt.

O., Dayton—TRUCKING—Delco Products, Div. General Motors Corp., 329 E. First St., trucking bldg., to C. Shook, 582 W. Second St., approx. **$50,000.**

Ore., Portland—PLANT—Stauffer Chemical Co., 624 California St., San Francisco, Calif., 100x168 ft. plant, concrete fdns., North Portland, to Drake, Wyman & Voss, Fenton Bldg. Est. **$100,000.** K. Theill, 624 California St., San Francisco, Calif., co. engr. Awarded 7/1.

Pa., Allentown—SUPER SERVICE STATION—Atlantic Refining Co., 260 S. Broad St., Phila. H. N. Bentz, dist. mgr., 627 Hamilton St., Allentown, steel, tile brick, master super service station, 7 and Liberty Sts., to L. W. Hunsicker, 821 Chew St., **$70,000.**

Pa., Altoona—PLANT—Linde Air Products Co., W. F. Barrett, chn. Bd., 30 E. 42 St., New York, N. Y., substructure, 1 story, 50x100 ft. plant, to Moyer Bros., Beale Ave. and 26 St. Total est. **$50,000.** Bids 7/15. CD 7/14—ENR 7/17.

Pa., Blawnox—FACTORY—National Alloy Steel Co., N. B. Ornitz, pres., Blawnox, foundation for 1 story, bsmnt., factory to Geo. M. Seaman Co. 6338 Penn Ave., Pittsburgh. Total est. **$40,000.**

Pa., Braddock—FACTORY—Standard Metal Products Co., M. Pfaff, pres., 9 St. and P and L.E.R.R., 1 story, part bsmnt., 40x256 ft. factory, 40x40 ft. office, brick veneer, steel, to J. A. Ramano, 6399 Morrowfield Ave. Est. **$40,000.**

Pa., Claysburg — SUBSTATION — Pennsylvania Edison Co., Bedford, brick, steel concrete substation, own forces and separate contracts. Over **$40,000** with equip.

S. C., Greenville—WAREHOUSE—Piedmont & Northern Ry. Co., M. D. Clark, engr maintenance and ways, 422 S. Church St., 69 Charlotte, N. C., 60x650 ft. warehouse facilities addn., to Henry B. McKoy Co., Greenville, J. E. Sirrine & Co., Greenville, consult. engrs.

Tenn., Memphis — WAREHOUSE — International Cellucotton Products Co., 1356 Riverside Dr., concrete, brick, steel warehouse, to Memphis Constr. Co., 160 Union Ave., **$175,000.** Hauker & Heyer, Commerce Title Bldg., archts.

Tex., Fort Worth—PLANT—Texas Steel Mfg. Co., c/o A. J. Armstrong, vice pres., 3901 Hemphill St., expanding existing production plant, separate contracts, **$275,000.**

Tex., Opelika—PLANT—Lone Star-Shamrock Oil Companies, Opelika (Shamrock Oil & Gas Co., Amarillo and Lone Star Gas Co., 1915 Wood St., Dallas, hdqrtrs.), recycling plant unit, force account. **$175,000.**

Wis., Eau Claire — FACTORY — Kruschke Conc. Products Co., 603 Vine St., 1 story, 60x127 ft and 21x29 ft. and 26x12 ft., cinder blocks, rein.-con. factory bldgs., concrete fdns. day Labor. Klinger & Hubbard, 218 S. Barstow St., archt.

Wis., Manitowoc—TANK—Wisconsin Malting Co., 618 S. 19 St., general contract 30x85 ft., rein.-con. steep tank addn., to Hamann Constr. Co., N. 8 and Reed Sts.; steep tanks, to Milwaukee Boiler Co., 1101 S. 41 St., Milwaukee. L. E. Peterson, 312 E. Wisconsin Ave., Milwaukee, engr.

Wis., Plymouth—WAREHOUSE—Cleveland Container Co., general contract, 1 story, 104x177 ft., rein.-con. warehouse, concrete fdn., to Peter Welling, Plymouth. E. A. Stubenrauch, 708 Erie Ave., Sheboygan, archt.

Ont., Blenheim—PLANT—W. G. Thompson, Blenheim, 50x60 ft. plant. Owner builds. **$40,000.**

Ont., Hamilton—FACTORY—American Can Co., Ltd., Medical Arts Bldg., factory addn., to W. H. Cooper Constr. Co., Ltd., Medical Arts Bldg. Est. **$50,000.**

Ont., Hamilton—FACTORY—Wallace Barnes Co., 274 Sherman Ave. N., 3 story factory addn., to W. H. Cooper Constr. Co., Medical Arts Bldg. Est. **$75,000.** Awarded 7/10.

Ont., Kitchener—FACTORY—Doon Twines, Ltd., H. Krug, mgr., Ottawa St., 1 story, 125x135 ft., brick, steel addn. to O. Wiles, 5 Maurice St. Est. **$100,000.** Steel, to Hamilton Bridge Co., Bay St. N., Hamilton. Awarded 7/23. CD 3/26—ENR 4/10.

Ont., Lynden—GAS PLANT—Dominion Natural Gas Co., 315 Colborne St., Brantford, F. D. Howell, mgr., gas plant., owner's forces. **$175,000.** Excav. and gdn., to Johnson Bros., 43 Market St., Brantford, awarded 7/14.

Ont., Ottawa—BREWERY—Capital Brewing Co., Ltd., 840 Wellington St., brewery exten., to Ross Meagher Ltd., 7 Echo Dr., Est. **$50,000.**

Ont., Porcupine—MILL—Preston East Dome Mines, Ltd., 200 Bay St., Toronto, mill exten., to Canadian Comstock Co., Ltd., 80 King St. W., Toronto, about **$100,000.** L. I. Hall, c/o owner, secy. and purch. agt.

Ont., Port Colborne—PLANT—International Nickel Co., H. H. Walters, local mgr., Davis St., 1 story, brick, tile factory addn., to Nordale Constr. Co., c/o owners. Est. **$100,000.** CD 6/26.

Ont., St. Thomas—PLANT—J. T. Findlay, archt., 19 Hincks St., 1 story, brick, structural steel, clay tile plant, for Weatherhead Co. of Canada, Ltd., W. Talbot St., to St. Jones, 244 Ridout St. S., London, about **$75,000.** Bids 4/16, awarded 7/14. CD 4/11—ENR 4/17.

★ **Ont., Sudbury**—MINE EXPANSION—International Nickel Co. of Canada, Ltd., Copper Cliff, expansion program at Murray and Stabie Mines, etc., incl. hoist, rockhouse, machine shop, steel sharpening shop, shaft, 6 dwellings, etc., at Murray Mine, hoist rackhouse, machine shop, sharpening shop, power and water line, transformer, pump. stations, at Stabie Mine, to Nordale Constr., Ltd., Copper Cliff. Total est. **$26,000,000.**

Que., Montreal — PLANT — Canadian Propellors, Ltd., 620 Dominion Sq. Bldg., superstructure plant, Hochelaga St., to Callet Freres, Ltd., 1978 Parthenais St., about **$350,000.** T. Pringle & Son, Ltd., 385 McGill St., engrs. CD 6/16—ENR 6/19, under CA.

Que., Montreal—PLANT—Montreal Locomotive Wks., Ltd., 5790 Notre Dame St., E., 1 story, plant addn., to Bremner Constr. Co., Ltd., 2049 McGill College Ave. Est. **$40,000.** CD 2/28—ENR 3/6.

Que., St. Jean de Matha — FACTORY — R. Durant, St. Jean de Matha, coffin factory, to E Frenette, 78 St. Laurent St., Quebec City, **$40,000.**

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estimated for engineering construction volume in 1941. It's already far ahead of 1929's all-time high. And the peak is not yet in sight.

WITH each passing week construction history is being made The national defense program is imposing greater demands on the construction industry than ever before in our history.

Already engineering construction volume in 1941 is far ahead of 1929, the previous all-time high for this period. And the peak is not yet in sight.

This unprecedented construction volume means more business now for manufacturers of construction equipment, materials and supplies, of course. But every manufacturer will not share alike in the present opportunity. As always, the farsighted, most progressive will profit most. For today's opportunity brings with it new problems.

For instance, new men are entering construction work and becoming important buying factors overnight. If you want them to use your products, it is important that you give them the facts quickly and completely. There is no better way to accomplish this than through well directed advertising.

Always a mobile industry, construction today keeps men moving from completed jobs to new and different ones getting under way faster than ever before. The one best way to keep your products before these fast-moving construction men is by well directed advertising.

Active periods of business always bring forth new products, new manufacturers. Some will succeed, others fail. But competition will become intensified and only farsighted manufacturers will remain out in front.

Manufacturers must safeguard their position in times of plenty against both established and new competition or else find themselves up against it when normalcy returns.

Well directed advertising will build greater recognition for your company and products and protect them from the inroads of competition.

Today's leading manufacturers know it is necessary to maintain sales and advertising efforts during a sellers market . . . to insure their leadership tomorrow. For they know that sales are made in the minds of men . . . and men's minds change! And they know that well directed advertising will keep the minds of construction men thinking of their products and changing to them.

Of course, no farsighted business man can think only in terms of the present. Even now, you are asking yourself, what of the future? What's going to happen to construction after the stimulus of defense work peters out?

Well, it's encouraging to know that government and industrial leaders are already far advanced on a practical program of post-war construction. A 12 million dollar appropriation has already been made to cover the cost of making final working plans for a highway program that will double any previous year's total.

In addition, a plan is in the making for a 50 million dollar revolving engineering fund to provide for advance work on a program of public works that will total at least two billion dollars annually.

And most encouraging of all, in this post-war planning, is the realization that the mistakes of the thirties shall not be repeated. In other words, the post-war program, designed to cushion the shock of transition from war-time to peacetime economy, will not be launched without proper preparation. Work will be done in the most modern and economical manner; wasteful practices frowned on.

Thus, present thinking on future planning is that the work will be done by private industry.

Hence, it is possible to look ahead to an active construction market long after defense work slacks off.

This means that the markets you create in the minds of construction men now will prove profitable not only today, but in years to come.

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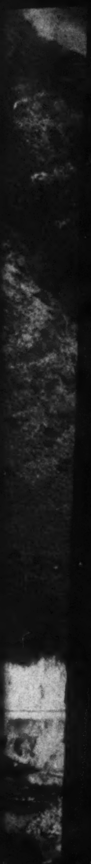

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